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AND THE NURSE'S DUTIES

A. de PRENDERVILLE

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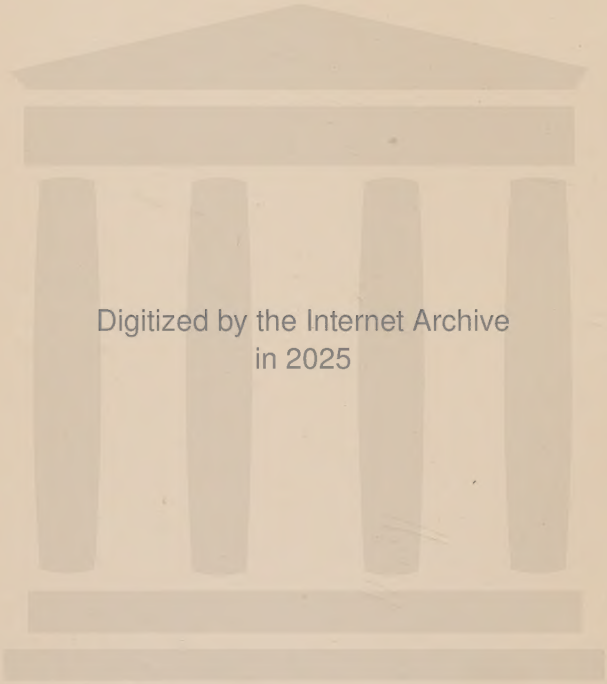

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ANÆSTHESIA AND THE NURSE'S DUTIES

TECHNIC OF THE IRRIGATION TREATMENT OF WOUNDS BY THE CARREL METHOD.

By J. DUMAS and ANNE CARREL. Authorized Translation by ADRIAN V. S. LAMBERT, M.D., Acting Professor of Surgery in the College of Physicians and Surgeons (Columbia University), New York. With an Introduction by W. W. KEEN, M.D., etc. Crown 8vo. Illustrated. Price 6s. net.

The success of this treatment depends upon the intelligent co-operation of nurses and assistants, as well as upon the surgeon's skill. Realizing this, Madame CARREL and Dr. DUMAS amplified the details of the treatment in this work, and the translation has been made for American and English nurses to supplement the more technical treatment of the subject by Dr. CARREL.

LONDON: WILLIAM HEINEMANN
(MEDICAL BOOKS) LTD.

ANAESTHESIA
AND THE NURSE'S DUTIES

BY
A. de PRENDERVILLE
LL.B., M.R.C.S.

ANÆSTHETIST TO CHARING CROSS HOSPITAL, W.; SENIOR ANÆSTHETIST TO THE THROAT HOSPITAL, GOLDEN SQ., W.; AUTHOR OF "ANÆSTHETIC TECHNIQUE FOR OPERATIONS IN THROAT AND NOSE," "PLACE OF ETHER IN GENERAL PRACTICE," ETC., ETC.

WITH AN INTRODUCTION BY
SIR JAMES CANTLIE, K.B.E.,
M.B., F.R.C.S.

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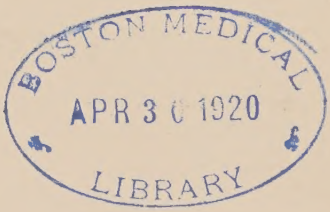

London: William Heinemann, (Medical Books) Ltd., 1919

INTRODUCTION

Mr. A. de Prenderville has approached the subject of Anæsthesia from a new point of view in several directions and especially by the inclusion of the nurse's duties in connection therewith. The nurse has the charge of the preparation of the patient for the anæsthetic, and, more important still, she has the care of the case after the operation is over, when the surgeon and the anæsthetist have departed. The period of post-anæsthesia is often of serious import, and the responsibility of the nurse is correspondingly great—vomiting, hiccough, disturbances in breathing, and cyanosis, are a few of the general points to be attended to. These conditions are most aptly and ably handled by Mr. de Prenderville in a fashion at once practical and scientific.

Each important operation, with the special points appertaining, is skilfully dealt with and clear directions given.

In this manual no point bearing on anæsthesia is omitted, even to the dangers to the patient whilst being taken from the operating table to the bed; the directions for the removal are in compliance with the best teaching as regards carrying and lifting—a subject which is not taught in our hospitals and medical schools.

Mr. de Prenderville has left us a valuable addition to surgery and to nursing. I say "left," for, as I write, I learn that Mr. de Prenderville died to-day quite suddenly, whilst engaged on Red Cross work, for which he has done so much, and given of his time and skill unstintedly to the wounded soldiers. His death removes a striking personality, a great teacher, as this manual shows, a man blessed with many friends, a delightful colleague, and in private life a charming companion.

His skill as an anæsthetist was remarkable ; it would seem as if a special gift had been accorded him. He has left to us a remarkable book, and the surgeon will find in the nurse who masters its contents a skilful assistant, competent to deal with the patient both before and after the administration. To nurses going abroad to our Crown Colonies and Protectorates the book is specially commended, for there doctors are few and far between ; but with a nurse trained as Mr. de Prenderville desires to see them trained, the surgeon will have a real helpmate, reliable and capable.

It is sad to think he has not been spared to live to see the triumph of the manual he has penned, for it is bound to be universally known and widely read.

JAMES CANTLIE, M.B., F.R.C.S.

HARLEY STREET, LONDON, W.
January 4th, 1919.

PREFACE

In the following pages an effort is made to put before the nurse in training some points of special interest in regard to Anæsthesia and her *rôle* in the matter.

Three years ago it was decided by the authorities at Charing Cross Hospital to increase the number of subjects on which lectures were to be given to the nursing staff. Much interest was shown in the scheme. In my own subject many subsequent enquiries convinced me that there was a real desire for knowledge. I am not aware that any grouped details exist—at least in book form—and, with a view of appealing to a larger audience, I have added somewhat to the lectures as originally delivered. Since they first appeared in serial form, many nurses have written asking to be instructed in practical work. Obviously, such requests were natural, and to be expected. At present they must be set aside; there is no machinery for dealing with the question. Personally, I can imagine no one more deserving of tuition than a carefully selected, conscientious, level-headed nurse, and no one, finally, whom I would more willingly teach.

The training and status of nurses is engaging at this very moment the close attention of many advanced reformers, and, be it added, of many far-seeing, virile administrative bodies. If the nursing profession is divided in the matter of control and leadership, it is certainly strongly united in its just and whole-souled claim for greater recognition. Modern nursing is undertaken for the most part by educated women—women often of affairs, capable, earnest, ambitious—and very prone to assimilate knowledge of the things that really matter. They have their own press. They know well what is done elsewhere. The war, more-

over, has helped as an efficient filter for definite international news. Sisters and doctors from the New World have brought to our doors and into our wards many strange tales of women's endeavour and success, and of the large part they play in professional and scientific life in the States—qualified and unqualified alike.

At a recent meeting of the Medical Society of London—reported in the "Lancet," Dec. 7, 1918—Mr. H. J. Waring (Representative of the Royal College of Surgeons on the General Medical Council), speaking on the subject of Reconstruction in Medical Education, said: "Nurses should be regarded as part of the medical profession, but in the past they had not been catered for as they should have been. . . . It was also a question whether surgical sisters and those in charge of operation theatres should not have practical instruction in administering anæsthetics. In military practice, during recent years, they had done very useful work of this kind."

We move slowly here—and guardedly. Our laws are strong to endure, but hard to alter. Hence, any change, if it does come, must come with time alone. Many signs seem to me to indicate the approach of a day when chosen nurses will, in their final year, be taught not only the science but the art of Anæsthesia.

I am indebted to the proprietors of the "Nursing Times" for permission to reprint such of the lectures as appeared in that journal, and to Messrs. Allen and Hanbury and Messrs. Mayer and Meltzer for supplying the wood blocks.

A. de PRENDERVILLE.

54, Wimpole Street W. 1.

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CHAPTER I

Preliminary Remarks

Pain is part and parcel of our inheritance from Adam, and, like many another inheritance, is of a very complex character.

In the beginning of all things, if man existed at all, he was equipped doubtless for his immediate environments—hardy, hairy, strong, with low mentality and brute strength, and a dullened sensibility.

What happened to him in times of stress and trial we know not; if he was built as we are, blessed (or cursed) with the same nervous organism, endowed with a like musculature, and organically identical, then for a certainty many thousands of millions of human beings must have passed through long agonies of pain from cradle to grave.

He had no traditions to guide him—he, the pioneer of prehistoric times, fell back upon his instinct for deliverance. Hence, when he was burnt by fire, or wounded in battle by poisoned darts, he applied soothing balms like wild honey in the one case, and for the other, heated wood-ash enclosed in bark. Heat, therefore, and soft oily matters were his chief, and maybe only remedies.

As time grew, he plucked from nature many useful things, and chiefly the lore and mystery of roots and herbs. From these he made crude liquors and rough unstable extracts—barbaric attempts, but often most effectual for relief.

It is impossible to trace the clear history of any single thing through the ages, but we know how man grew and multiplied, and how, as we approach the time when records were first made, written evidence is given of remedies and treatments of universal and general acceptance.

For the relief of *pain* we find *heat* and *pressure* first in order. Heat was applied by the ancients in various ways, chiefly in the form of cataplasms. For this purpose many roots and herbs were greatly valued, as, for instance, aconite, belladonna, bryony, and henbane. Early, too, our forebears learnt the use of immersion of limbs and burnt surfaces in hot water. This acts largely by excluding the air from the exposed nerve endings, which are highly sensitive.

Pressure was familiar quite early as a means of arresting pain. Neuralgias of all kinds, especially those occurring in the vicinity of bone, readily yielded, for the time being at any rate, to careful graduated pressure.

Sometimes bandages were wrapped round limbs or across the forehead for the same purpose. Not always successful, pressure sometimes led to disastrous results—œdema and mortification of limbs from too tight constriction. Pressure and

heat combined always gave, in suitable cases, relief. This found its ideal expression in the application of fomentations to joints, and the rapid treatment of local inflammation by sponges dipped frequently in hot water, and then pressed against the affected spot.

Of *herbs* and *roots* devoted to the relief of pain, their names is legion. The ancients had great knowledge of simples good and bad, and used them frequently—hemlock and belladonna, hyoscyamus, and many others in flower and root, some for external, others for internal use.

Of all drugs given of old, none has come down to us with a more weird and sinister reputation than *mandragora*, yet nowadays we look for it in vain. Doubtless much efficiency was ascribed to this special drug because it was the *pièce de résistance* of necromancers and other occult professors, including witch doctors and political poisoners. How much real virtue mandragora possessed we can only guess at through the various tales and legends which have filtered through to us. It was largely used down to the Middle Ages, and then gradually fell into disfavour, and lastly into disrepute and absolute oblivion.

With the advent of *opium*, aptly called "The Gift of God," the relief of pain entered upon a new era, which has lasted, and will last for ever. When the poppy first yielded up its secret, men thought that at last they had discovered the

panacea for all ill. It absolutely displaced all other remedies for its narcotic effects, and equable if somewhat depressing results.

The coming of opium undoubtedly paved the way for anæsthesia. Until that event, men sought in vain for some nepenthe to soothe the wretched sufferer destined for the surgeon's knife. Operation of old, when needed, was done upon the conscious subject, and with the full knowledge on his part that every cut and thrust of the knife would be felt. Celsus tells us that one of the greatest traits of the ancient surgeon was "pitilessness." That and brute courage and a callous heart made up the man as Greek and Roman writers saw him.

Opium changed all that. Patients fitted for operation were heavily drugged with laudanum, and while deeply or partially insensible went through their ordeal without pain or trouble.

There must have been much abuse of this remedy, and obviously it was a dangerous drug to put within the reach of unprincipled people. Moreover, in many cases it proved insufficient, so that in time it came to be administered in combination with alcohol.

Thus, during many wars among civilised people, down even to the Peninsula Campaign and Waterloo, opium alone, or combined with alcohol, was invariably and even exclusively used in all operations. Many stories are told of soldiers who refused opium and preferred alcohol,

or even nothing, previous to amputation; we know that Larry, the great French surgeon, performed numerous operations both with and without opium.

No sketch of ancient methods to relieve pain would be complete without an allusion to hypnotism and suggestion. The black art and hypnotism were supposed to be so closely allied with witchcraft and demonology, that we must be chary of accepting all the stories which have come down to us about hypnotism. It is certain, however, that as many people nowadays have the gift, or cultivated training (if you will), of imposing sleep and suggesting absence of pain during that state, so, perhaps, in a more marked degree had the old professors this power.

It was precisely because they possessed power, and very often abused it, that hypnotism became taboo in learned and medical circles.

As an instrument for good it was much used in past times, and undoubtedly must be acknowledged to have played no small part in reducing pain and trouble in both surgery and medicine.

Lastly, a brief mention of *ice* and *salt* combined, to relieve pain. This method was well known before the introduction of local anæsthesia. The mixture produced intense cold when applied to the surface of the body, and was much used to diminish pain produced by the necessary skin incisions, say in opening small abscesses. The condition produced was analagous to frost-bite,

and much pain ensued as the circulation in the parts became gradually restored.

Race and temperament have much to do with the ability to bear pain. Broadly speaking, the lower the mentality, the greater the power to bear pain, or perhaps better, the greater the power of self-repression. North American Indians and Chinese are great stoics under personal torture, and remain, unheard and silent, even in extreme suffering.

As a race, the lower caste Chinese have been so inured to oppression and violence from their masters, that they face punishment very bravely. Nothing can exceed in barbarity the penal code under Chinese law, and that it is no dead letter, anyone familiar with the Far East can vouch for from personal observation. But, apart from criminal records, we have certain knowledge that many Eastern races are very largely insensitive to pain as we Europeans know it.

To quote the Chinese again—it is, I think, beyond question that anticipation of danger or suffering, say from prospective operation, has no effect in unnerving them, and many minor operations, such as extracting teeth and paring raw surfaces for fresh union, elicit only the faintest resistance, and often none at all.

Pain, therefore, appears to depend somewhat largely on the extent to which the nervous system has been attuned.

Temperament also is a factor to be noted.

Many people in our enlightened times are called "temperamental," whatever that may precisely be. We speak of many varieties, but really only one stands out as a distinct and popular brand—the artistic temperament. As far as we are concerned, the artistic temperament implies marked inability to bear pain, and the greatest possible tendency in many cases to simulate it.

With these preliminary remarks we must now proceed to investigate the history and discovery of Anæsthesia.

CHAPTER II

Historical Sketch

In former centuries man was granted much relief from ills and pains by drugs and extracts, or decoctions of roots and flowers. The ingenuity of necessity knew no limit, and so our forebears evolved many wondrous remedies to give them ease and rest, and when bruised and injured, much surcease from suffering. They put their trust in nature, and nature repaid them a hundredfold. In olden times the alchemist, dealing only in the occult, and searching always for the unattainable and mystic, moved in the narrow groove of ignorance and superstition. It was reserved for a later age, and a band of workers trained in exact science, to seek out and capture many hidden truths, and among them the properties of almost the whole group of modern anæsthetics.

The discovery of hydrogen in 1766, nitrogen in 1772, and nitrous-oxide gas in 1774, were events that had a large eventual bearing on modern anæsthesia. Humphry Davy was so satisfied with the lulling effect of nitrous-oxide, that he submitted to have a wisdom tooth extracted from his own jaw, and predicted that this agent would be generally adopted. This

occurred in 1800. Fifty years later his words came true. Everywhere experiments were being tried with the new gases, and if many observations were made, few results gave promise of permanent success.

Between the years 1820 and 1828, a series of remarkable and accurate experiments were made by a young English surgeon, Henry Hill Hickman. He was greatly shocked by the agonies patients had to suffer during surgical operations, and in order to try and devise some methods of alleviation, he selected groups of the lower animals and made definite experiments with the recently discovered gases. So successful were his results, that he determined to bring his work to the notice of the medical profession. Unfortunately, he met with nothing but rebuffs. His work was ridiculed and condemned. Seeing no prospect of acceptance in his own country, he crossed the Channel, and brought his claims for recognition before the French Academy of Medicine.

King Charles X ordered a special commission to inquire into them, but here again, surgeons looked askance upon the whole thing and ignored his pretensions entirely. Broken in spirit and health, he returned home to die. He was only twenty-nine, a tragic pioneer of anæsthesia!

The next great epoch began in 1842, when ether was first used in surgery. Its effect as an exhilarant had been already known for years.

Long, of Georgia, first tried it on March 30th, 1842, in a case of tumour of the neck. During the three following years he had eight more cases to report, all under ether. Unfortunately, the work of a country practitioner is not blazoned forth with noise and fury, and nothing was heard of him beyond his own narrow circle.

"The University of Pennsylvania, of which he was a graduate, has recently unveiled a Medallion in his honour, and the State of Georgia has sent his name to Washington as one of her two most celebrated sons."

It is only fair that this should be so, for, in the rush and whirl of modern days, we are prone to forget the great humbler workers of the past.

The year 1844 saw the introduction of nitrous-oxide gas into surgical practice. Wells, of Hartford, Conn., had carefully observed the conduct of persons who inhaled the gas at lectures and demonstrations. This was a popular method with public performers at that time, and numbers of people in search of amusement and excitement offered themselves as willing victims.

Wells noticed that some, who had inhaled too freely, fell about and bruised themselves, apparently without feeling any pain. He was determined to carry his inquiries further, and in fact arranged, without delay, to have a tooth drawn while under gaseous influence.

Dental friends helped him to this end. No pain

was felt and the demonstration was triumphantly successful. After this, many operations were done in dental practice with nitrous-oxide, until, in an unhappy moment, Wells offered to demonstrate his method before the Harvard Medical College. Something went wrong, and both Wells and nitrous-oxide went out!

For twenty years it remained, as it were, in eclipse. Then at last vigorous steps were taken to rehabilitate what many felt to be an invaluable anæsthetic aid. In 1868 Evans, of Paris, administered nitrous-oxide before the Dental Hospital of London, and in December of the same year an authoritative report was issued, so favourable in tone, that it has since become firmly and universally accepted as the first and safest narcotic for dental use.

Of the subsequent introduction of nitrous-oxide and oxygen combined, it may be noted that here, too, the pioneer work of yet another American cannot be ignored.

Andrews, of Chicago, made trial of a mixture of nitrous-oxide and oxygen and obtained good results, but, in spite of this, his example was not followed by others. At that time it was definitely taught that air should be excluded in administering gas. Andrews sought to show that the addition of small amounts of oxygen improved the anæsthesia and abolished asphyxial symptoms.

It was left for an English anæsthetist to show that by carefully adjusted valves and other

mechanism, a graduated mixture of oxygen and nitrous-oxide gave highly favourable results in dental work. Hewitt's method obtains now almost invariably in this country. Its application to general surgery, especially to minor surgery, has proved a great boon. Many other names have been intimately associated in the evolution of this agent. In a short essay it is possible only to mention the chief actors.

It is curious how much we owe to American zeal and ingenuity in this regard, and how, in spite of prejudice and much opposition, an agent of such beneficence remains.

The Coming of Ether.—The first half of the nineteenth century was rich in chemical discovery. At the end of the fourth decade, and chiefly through the labours of Morton and Wells, ether as a practised anæsthetic was first *publicly* used.

To Morton belongs the great fame of demonstrating its value. Trained to observe, through years of patient toil he carried out many experiments on animals, and finally did not spare himself in the endeavour to learn the truth. We read, in a record by his wife, that Morton devoted every spare hour to experiment. He tried ether on dogs and beetles, and even worms, and carefully noted the symptoms.

When time was ripe, he administered ether to himself, and was unconscious for several minutes. This result determined his course of action. He

offered to anæsthetise a surgical patient before the Staff of the Massachusetts General Hospital. At the appointed hour all had assembled, but Morton did not appear. The patient was on the table, and the surgeon was about to begin, as usual, without a narcotic, when the would be demonstrator hurriedly entered, and without delay proceeded to his task. He was triumphantly successful, and was at once acclaimed.

In the scanty notes available, we learn that the operation took twenty minutes to perform, and that the patient was quiet during the first half, and restless only towards the end. Moreover, on recovering, he said that he had felt no pain, but only a sensation as of scraping at the finish.

Bigelow, who was present, remarked, "I have seen something to-day that will go around the world." It was a prophetic saying. All over the American Continent surgeons tried the new drug, and its value and reliability was abundantly established.

Two months later, in December, 1846, the fame of ether had spread to England, and Liston performed two operations at University College Hospital under it. It would take too long to give the full history of this great achievement. Good tidings soon spread, and before many months had elapsed every hospital in the civilised world had adopted it.

For a long time ether was largely used in obstetric practice, and proved invaluable as an

aid in difficult labour. Complaint was made at its irritating nature, the tendency to produce cough and secretion often proved troublesome, and again, after-effects were noticed, such as sickness and bronchial catarrh. Nevertheless, in the absence of any rival, it held the field, Many objected to its pungent odour, but all agreed that it produced unconsciousness without lessening the force of the uterine contractions.

About this time, Simpson, of Edinburgh, being dissatisfied with ether, which he had hitherto used exclusively in his obstetric work, turned his attention to a new drug, and, after many trials, finally adopted chloroform as a general anæsthetic instead of ether.

The Coming of Chloroform.—In the year 1847, Flourens, a French chemist, drew attention to the effect of a "curious liquid" called chloroform upon animals. This liquid had been discovered independently by two other savants, Soubeirau and Liebig, at a still earlier date, and its chemical composition studied in the intervening period.

The suggestion to try chloroform was first made by Mr Waldie, of Liverpool. It was probably brought to the notice of Simpson when on a visit to that city, and promptly accepted for trial.

We have on record an accurate and intensely interesting account of the first experiments carried out by Simpson and his friends. These took place in his own dining room, the con-

spirators being Drs. Simpson, Keith and Duncan. Tumblers were charged with chloroform, and the brave pioneers sat down and calmly inhaled the vapour given off, until in rapid succession they each succumbed to the narcotic effects and became unconscious. The whole adventure was most hazardous, but gave brilliant results. Many other recruits offered themselves the same evening, and each fresh trial helped to confirm the verdict already given.

The following day, we are told, Simpson took immediate steps to secure the co-operation of active partners in beginning the manufacture of chloroform on a large scale. The Scottish firm of Duncan and Flockhart were the first to help in this great work. They have since become, and still are, famous for their chloroform.

It may not be amiss to state here that chloroform originally contained many impurities which improved methods of manufacture have helped to eliminate. Nowadays, so high is the standard of purification, that nearly all public issues of this drug are thoroughly reliable, no matter what their source of chemical origin may be. This is a great safeguard for the public, and incidentally for the profession.

In the early days of this great discovery, an incident occurred which might have delayed the whole progress of anæsthesia for many years. Professor Miller, of Edinburgh, had arranged that Dr. Simpson should administer chloroform in a

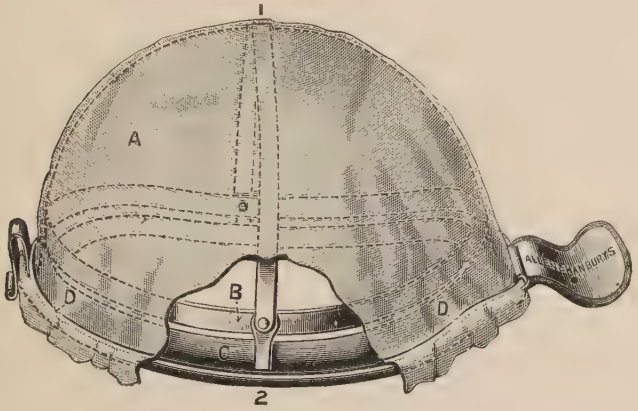
surgical case. The surgeon became impatient because the anæsthetist was late (how like our own times!), and proceeded to operate without him. At the first cut the patient blanched and died! Such a subject might have equally well died under the narcotic. Blame would have inevitably been hurled at the new drug, and chloroform might have been lost to us for a decade.

Among the many advantages claimed for it were ease of administration, agreeable odour, lessening of throat and bronchial secretion, and the total absence of apparatus. Moreover, the condition of unconsciousness produced was free from general flushing and moisture which prevailed with ether. Strange as it may seem to us in these days, much opposition was shown, both in England and America, to the use of chloroform (and ether), especially in childbirth, purely from a theological and so-called scriptural point of view.

Simpson boldly countered his opponents and eventually drove them from the field.

Little or nothing was known about the dangers of chloroform, and it came somewhat as a shock to find many fatalities recorded as its use became more extended. Snow and Clover stand out in this country as investigators, and largely through their labours we came to know a very great deal about the safer methods of administering both ether and chloroform.

Many suggestions were made for lessening the dangers of administering chloroform. Mixtures and substitutes were tried. It will suffice here to speak only of the A.C.E. mixture. This consists of alcohol one part, chloroform two parts, and ether three parts.



Author's Chloroform Rack.

The alcohol was said to equalise evaporation, and help the admixture of the two drugs. In recent years, the C and E mixture (one part chloroform and two parts ether) has supplanted it in favour, and gives excellent results. Another variant is the Vienna mixture (chloroform one part, ether three parts), in much demand abroad, and but little used here. These mixtures are never to be given from a closed container, but

always on an open mask of flannel, lint, or layers of gauze.

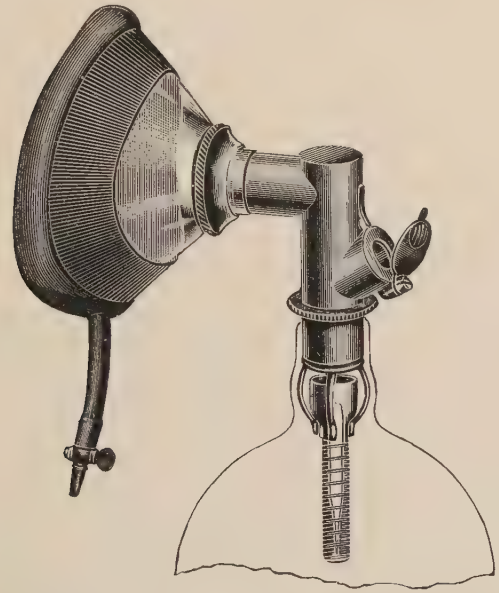
In recent years chloroform and oxygen have been largely used. In many cases the combination is invaluable. You will have seen in well equipped theatres cylinders of oxygen ready mounted and gauged for instant service. The indications for resorting to oxygen can hardly be dealt with here, but, broadly stated, it is used when much shock and pallor indicate general physical failure. The stream of oxygen is carried into the mouth either through a glass funnel fitted to the patient's face, or through a bent metal tube placed within the cheek.

Ethyl Chloride, though known for long, was only generally adopted in 1895. It quickens and deepens respiration. During the stage of excitement muscular rigidity is present, and, unless the mouth is kept open with a wedge or gag, dangerous asphyxial symptoms may follow.

When first introduced, ethyl chloride was looked upon as a great desideratum for short operations, and especially for dental cases. Sickness, however, is fairly constant after an administration—an awkward sequel in the dental chair, hence, its vogue in this connection was short-lived. In hospital out-patient throat work it is very useful. The average period of unconsciousness is about three minutes, an ample margin for experts in this specialty. In general surgery ethyl chloride is fairly frequently given

as an introduction to other narcotics. It is often of great value in this regard.

During the last few years great advances have been made in anæsthetic technique. It is



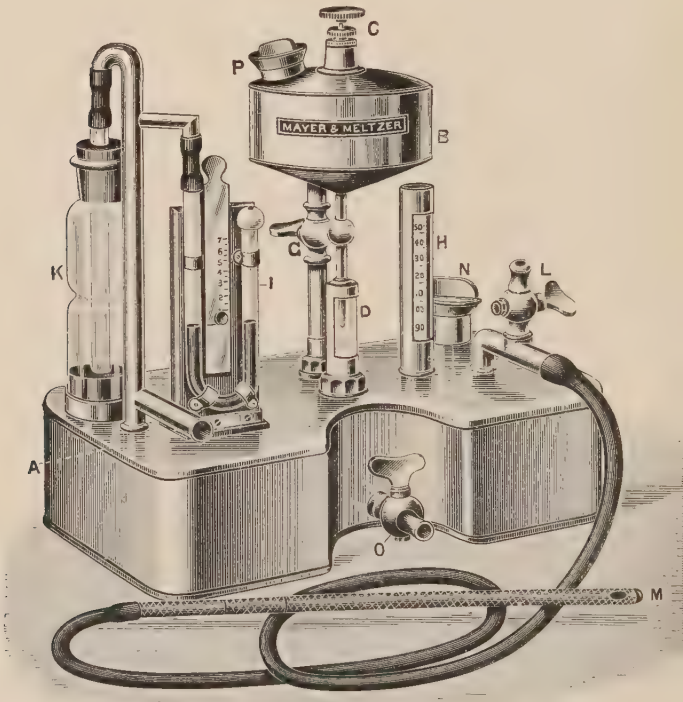
Apparatus for administering Ethyl Chloride.

necessary that you should know something of this development.

(1) Intra-tracheal ether, and (2) intra-venous ether. These terms explain themselves.

In **Intra-Tracheal Insufflation**, a mixture of air and ether is driven into the trachea by external

pressure, through a tube introduced into the larynx. This method is indicated in thoracic surgery, in certain operations on the head and



Shipway's Intra-Tracheal Ether Apparatus.

neck, and specially in extensive operations within the mouth, where it is necessary to keep the larynx free of blood. With a tube placed within

the trachea, it is obviously impossible for blood to enter the lungs, the constant stream of air expired from the lungs being sufficient to expel any blood impinging on the tracheal opening. This method is also exceedingly useful in anæsthetising patients suffering from intestinal obstruction, as all danger of aspirating vomited material into the trachea is obviated. Special apparatus is, of course, needed for exhibiting this method.

Intra-venous Ether.—A five or seven per cent. solution of ether with sterile normal salt solution is held in a glass container of 2,000 cc. capacity. This container is upheld on a specially constructed pedestal, about eight feet high. The fluid (at about blood heat) is delivered through rubber tubing, leading below into a small glass cylinder immersed in a metal holder filled with hot water. From this point the solution is conveyed through further tubing direct to the vein selected. Entrance to the vein is effected through a sterile needle firmly secured to the end of the terminal rubber tube. Great care has to be exercised in regulating the flow of solution into the vein and in excluding air. Narcosis induced by the intra-venous route is remarkably equable. For some types of case it is invaluable. As much fluid may be injected during a long operation, it is necessary for nurses attending in the post-operative stage to turn the patient at intervals from one side to the other. In this

way œdema of lungs may be avoided; this manœuvre should never be neglected.

Intra-venous narcosis has distinct points in its favour, but it is troublesome to manage, and requires *very* close attention and no little skill on the part of the anæsthetist. It will never be very popular, chiefly because the apparatus required is cumbersome, and, therefore, difficult to carry from one place to another.

Spinal Anæsthesia.—This method has made great headway in recent years, and though opinions differ widely as to its value, it has unquestionably come to stay. The technique is exact, and demands close attention to detail.

As you know, the whole secret consists in introducing a trocar and cannula between the spines of two lumbar or lower dorsal vertebræ until they enter the spinal canal. This is known to have been effected when clear fluid is seen to drop or flow out of the external opening of the cannula. Then through the cannula, *in situ*, a solution of novocaine or stovaine is introduced into the spinal canal, and the patient is at once requested to lie down. The operation described can be done with the back bent, or with the patient supported lengthways on one buttock. The immediate effect is gradual and increasing loss of sensation and motion in all parts below the site of injection. A condition of complete temporary paralysis of motion and sensation sets in, which lasts for two, three, or more hours.

Operations of the greatest magnitude can be performed while the patient is in this state. He feels nothing, though he is quite conscious throughout.

Among the drawbacks are the fact that the patient is spared nothing of the details of the situation, that faintness and collapse may occur, that having delivered the dose, nothing can be done to stay the full force of the narcotic, and, finally, that there is a risk, admittedly a very faint one nowadays, of the paralysis remaining.

At one time there was danger of the fluid rising up in the spinal canal to a dangerous level, and so thereby gravely embarrassing respiration. The specific gravity of the solution was originally in fault. This has now been corrected. The more the fluid introduced is isotonic with the cerebro-spinal fluid, the safer and better will be the anæsthesia produced. Before beginning the procedure outlined above, every care must be taken to sterilise carefully the patient's back at the point selected for puncture. This is essentially the nurse's care, though in practice the surgeon or anæsthetist sterilises the parts afresh. On withdrawing the cannula, a speck of blood will appear at the punctured spot; this must be wiped away with a sterile swab and the place smeared with collodion. No further dressing will be required.

Nurses will never be required to lend an active hand in these proceedings; their chief duty will be

to have all dressings and details, instrumental or otherwise, carefully sealed and intact. It is clear that, without precise technique and attention to secure extreme surgical cleanliness, grave danger may be caused. During the operation patients sometimes feel faint or have a tendency to vomit. Sips of water are allowed if syncope threatens. Screens are invariably interposed between the patient's eyes and the site of operation, and it is usual to engage him in gentle and exiguous conversation during his ordeal.

Local Anæsthesia.—There are three distinct variants of this method: (*a*) spraying the surface about to be operated upon; (*b*) injections of solutions into and under the skin; and (*c*) spinal analgesia already described.

Spraying the surface is familiar to all of you. Should it be required to open a small abscess, say, of finger or arm, you will have seen the spray of ethyl chloride turned on for half or one minute. This produces blanching of the surface, intense cold, and numbness. At the moment the spray is withheld the surgeon makes his incision, and though the final cut out may be felt, the primary plunge is painless.

Local Anæsthesia may be, and is, used in practically every part of the body. The technique has been worked out on regional and anatomical lines, and several text books on the subject exist. We have, therefore, exact data to go upon. Solutions of novocaine, cocaine, eucaine, combined with

adrenalin, on the one hand, or urea and quinine hydrochloride on the other, are injected between the layers of skin so as to desensitise for subsequent incision. Deeper structures are then attacked by deep injections at various points, until finally an area of asensitiveness is established. A good knowledge of anatomy is essential for dealing with large nerve trunks, and it is sometimes difficult to exclude all sensation in certain bony regions.

These, again, are procedures in which the nurse will have no immediate share. Her duties will be carried out on ordinary lines, except that, with a knowledge of what has been done, she will naturally be careful of the surfaces involved, and attend to special instructions which the surgeon may from time to time indicate.

It remains only to say a word or two on *suggestion* and *hypnosis* in concluding this sketch of the history and progress of anæsthesia. *Suggestion* really is as old as the eternal hills. In this connection it consists largely in gaining a certain dominance over the patient to be narcotised, in impressing him with your personality, in gaining his confidence in your immediate skill, and, lastly, in asking for a practical proof of that confidence forthwith. My own rule is to demand a promise from the patient that he will keep his hands interlaced throughout the whole sequence. Voluntarily he

clasps his hands together at my request before we begin. I then impress upon him at intervals, by word of mouth, the imperative need of keeping his hands closed. I ask him further to clench them tighter should he feel inclined to struggle. Until consciousness is lost, my mind is occupied in mentally repeating the original injunction. It is, in fact, an effort to keep before one's own mind the fixed intention, and to will its fulfilment in another. The manœuvre works well. Under this influence patients require little or no restraint. On strong outdoor men, lusty soldiers, for instance, it does not always succeed.

Hypnosis has been tried effectually in a large number of cases. Many years ago, remarkable results were reported by Esdaile, who laboured in India with native patients. Since his time, many others have used hypnosis in surgical practice, but though it cannot be denied that individual practitioners have justly claimed successes, the art is rarely put into practice, at least in this country. In fact, charlatanism and hypnosis have been so often commingled, that the medical profession is chary about recognising officially this art as an adjuvant in matters surgical. Enthusiasts declare that hypnotism will nearly always produce a state of insensitiveness, definite and exact, and one, too, free from danger, during which operations may be readily performed. If this be so, then we are unwittingly

excluding a method of great value. Perhaps a future generation will recognise, more fully than we do, the claims that have been made for it.

CHAPTER III

General Survey of Conditions Conducive to Favourable or Unfavourable General Anæsthesia.

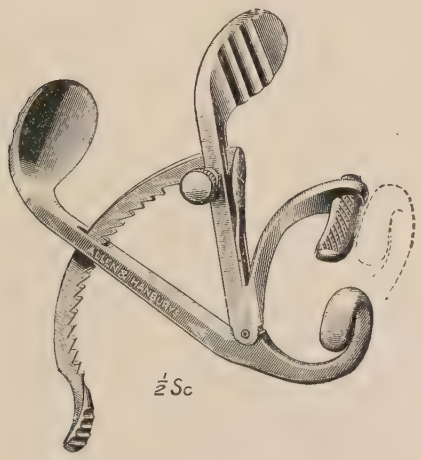
This is a subject of much importance, and one which merits careful consideration. Under this heading we may group age and sex, impaired vitality, alcoholism, habits of body (corpulency, thinness), the presence of active organic disease, recent injury, blood loss, fear, and many other subsidiary factors.

Age and Sex.—Children of the tenderest age, provided that they are in fair condition, take anæsthetics well. Care must necessarily be taken to limit the amount of vapour inhaled and to select the appropriate narcotic. Thus, nitrous-oxide gas is not the proper agent with children under two years; their lungs are unequal to the strain likely to be put upon them. For them chloroform or C.E. mixture is a much better selection. At the other extreme of life, special care must be exercised to prevent, if possible, undue straining and cyanosis. Arteries are brittle in old age, and are apt to give way. In middle age and in young people general rules obtain.

Sex.—Women are better subjects than men,

and give, as a rule, far less trouble. There are many reasons for this. Their musculature is generally less developed, and their lives modelled on lines of greater abstinence than the lives of men. Of course, to this rule there are many exceptions. Nevertheless, the rule holds good.

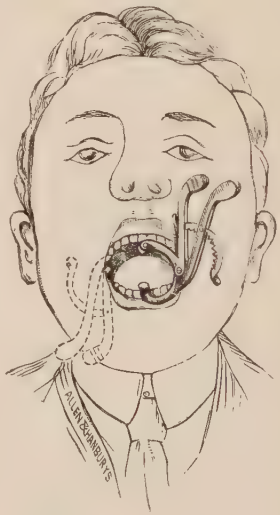
Impaired Vitality.—From whatever cause in-



AUTHOR'S REVERSIBLE GAG.

duced, impaired vitality is an unfavourable factor for anæsthesia. Bad feeding and unhealthy surroundings produce this result, especially in slum dwellers. They suffer from surgical shock with surprising frequency, and have to be carefully watched throughout the sequence. Oxygen acts well with this type. They almost always

look sallow and "washed out," and rally badly after severe operations. The best preparation for them is rest in bed for some days, with adequate and special feeding. Anything that will improve the quality of their blood will make for surgical and anæsthetic success later on.



AUTHOR'S REVERSIBLE GAG, with (1) handle in upper jaw, (2) handle in lower jaw.

Alcoholism. — The difficulty with drinkers (spirits and beer) is to get them under without great struggling. This produces marked congestion and often cyanosis. In addition, they absorb large quantities of chloroform or ether and easily pass out of control. An alcoholic is usually a troublesome handful to tackle. Suggestion does not appeal to him. Nothing remains but to hold him down until he becomes unconscious. To this end nurses stand ready on either side, while students act in reserve. Gags and tongue forceps must be handy. The pharynx and tongue in such individuals are usually thick and brawny, and the latter organ frequently falls back and blocks the air-way. An alcoholic in

full blast is not a pleasant picture to look upon. He must be dealt with on his merits. His return to consciousness is curiously rapid, and his conduct afterwards sometimes uproarious. Nurses must remember that habitual drinkers are rather prone to have sodden lungs; they suffer much from bronchial catarrh; hence, their after-care in the wards will entail fairly constant change of position.

Corpulency, if extreme, gives cause for great watchfulness under anæsthesia. In this state the heart muscle is often flabby, and the ventricles probably dilated, and, it may be, inadequately hypertrophied. Such patients may be definitely asthmatic, and are usually breathless. In addition, as a type they are short-necked, with rolls of fat under chin and jaw. Acute abdominal operations on very stout people are most unfavourable from the anæsthètic point of view. Moderate degrees of corpulency are negligible. Unless there are indications to the contrary—presence of heart disease, arterio-sclerosis (thickened arteries), dropsy, or diabetes—patients do well. It is generally recognised now that very stout people should have their shoulders well raised in bed, as soon as this can be managed after operation. This prevents passive lung congestion, and assists thereby the general systemic and pulmonary circulation.

Other things being equal, the *thin* make ideal patients. They take all anæsthetics well. Two

chief groups of this type exist: (*a*) the thin, oldish people; (*b*) the thin, young and middle-aged. The former are naturally easier to deal with; their resistance in early stages is less, and they get their anæsthetic equilibrium sooner. Men who boast that they haven't got an ounce of superfluous fat (the second group) are strong and wiry; firm strugglers at the beginning, they calm down rapidly and soon pass into smooth waters. Of this type is the athlete. His muscles are taut and hard—so well developed, indeed, that they can only be made to relax with full doses of the narcotic. In consequence, he requires close attention to secure a safe sequence. Sometimes the heart muscles show signs of exhaustion. It is the duty of the anæsthetist to watch every move on the board. For the nurse there will be a light task in after-care. Recovery is rapid, and, as a rule, uneventful. It is only when men of this type are big smokers that trouble may be feared. Then they are sometimes difficult to manage and become unruly. Clenched jaws in strong men are hard to open, and broken teeth cannot be mended. Later, we shall deal with methods of relief in such cases. Laryngeal stridor now and then occurs in strong subjects. It is difficult to deal with, and not infrequently persists, in spite of all efforts to subdue it.

Recent Injury.—This frequently produces shock and often blood loss, and, by so much, is an unfavourable factor for general anæsthesia.

On the other hand, cases of dangerous injury often require but little anæsthetic.

Fear.—Many people dread the approach of operation and express the opinion that they will die under the anæsthetic. It is not often met with in the calm and well-balanced; when a patient of good mentality gives verbal expression to fear of the result, the matter is more serious. It is then a case of deliberate auto-suggestion, and must be treated by counter-suggestion. Here there is a real chance for the nurse. She comes into close contact with the patient for some days before operation, and can naturally and easily comfort and reassure her charge, pointing out the need of taking healthy and optimistic views, banishing doubts and fears, and generally inspiring confidence and courage.

Experience teaches that when fear persists we must exercise more care than ever in administering the anæsthetic, preparing the patient by hypodermic morphia and atropine perhaps beforehand, and then proceeding on the usual lines. In the absence of active heart disease these cases do well.

Two other matters may be mentioned in regard to our general survey—one is the presence or absence of lymphatic signs, and the other the state of the pulse.

Lymphatism has been accurately described in recent years. Patients, usually under twenty, die suddenly while being anæsthetised. There

is nothing apparently to account for it. At one time it was the reproach of anæsthesia. Autopsies conducted by experts gradually revealed the fact that lymphatism was a real pathological entity. Enlarged thymus glands at the root of the neck, glands enlarged at base of tongue, increase of lymphoid tissue elsewhere, and commencing fatty degeneration of the heart muscle—these definite conditions, or most of them, could always be demonstrated. Lymphatism, therefore, is a dangerous factor for anæsthesia, and we must endeavour to diagnose it beforehand. Signs and symptoms, unhappily, are nearly all negative. There is one definite objective sign that may be regarded as positive—if it can be demonstrated—and that is the enlarged thymus gland. Be it remembered that this gland, after the second year of life, begins to shrivel up and is practically non-existent in adult life. In lymphatism it persists and remains large. To reveal it, percuss over the trachea at the episternal notch *during the act of swallowing*. As this is clearly not a question for light discussion, and as it does not enter into a nurse's duties in any aspect of the case, I will say no more.

The **pulse** is a fairly good general indication as to condition, if it is carefully studied. For instance, the hard, incompressible radial tells us what is the state of the arterial walls. The pulse at wrist easily obliterated tells another story. What we have to regard from the anæsthetic

point of view is, among other things, tone and volume, and, especially, rapidity or slowness.

Rapidity of pulse is the natural sequence of emotion. It is a normal reflex act, and, as such, beyond control. When, therefore, patients are brought into the anæsthetic room with quick beating hearts and rapid pulses, provided there are no other adverse signs, we regard the situation with satisfaction. Curiously enough, the subjects themselves are alarmed at their own symptoms. They must be reassured. It is a good sign.

As against this, the *slow pulse* is to be regarded warily. In the presence of emotion there is no response. What is the range of the slow pulse? From fifty-four beats per minute down to forty.

Patients with slow beating hearts may often give trouble during an anæsthetic sequence. Nurses will do well to note these cases. They will repay any study given to them.

CHAPTER IV

Preparation of Patients for Operation.

In training, special stress is laid on careful attention to details. Nurses must learn to be exact. It is just because they are exact that such good results are seen in our hospitals. Patients, therefore, destined for the theatre must be subjected to a minute overhaul. Let us consider a few points in this connection.

State of the Bowels.—Clearly, the emptier the bowels are before an anæsthetic the better. This will be arranged for on the usual lines—a purge, not on the night before operation, but on the night before that again, and an enema on the morning of operation itself. This is the first step in what Americans call "grooming the patient." The intestinal tract is the constant habitat of millions of microbes, so that a complete flush out will do much good. In addition, post-operative gaseous distension is probably much diminished. For special surgery of the nose and throat, such elaboration need not be aimed at. In-patients will, if possible, be rested in bed for a day or two before operation; during this time a purgative may be given. An enema is not required. The same ruling applies to children brought up

for adenoids and tonsils, especially if they are not to be detained afterwards.

Examination of Teeth and Mouth.—Dentures must be recognised and removed, loose teeth noted and reported, and any detail in regard to cleanliness of teeth and gums attended to. If the mouth is foul from the presence of decayed teeth, every effort must be made to have these cleansed, and, in many cases, removed prior to operation. Very often extraction is imperative, notably in operations on the tongue and trachea. Acute sepsis is easily set up when this precaution is neglected. Care of the mouth is usually ignored among the lower orders. The tooth brush is an unknown luxury to the working man. Hence the need for close inspection on the nurse's part. An antiseptic wash for swilling out the mouth is indicated in most cases, and can be readily prepared. Sanitas is very useful; so is Condy's fluid, or listerine.

Nutriment before Operation.—There is much difference of opinion on this point. The usual rule is to give patients a small cup of weak tea and a thin slice of bread and butter some four hours before the case is taken. In throat cases, arranged for the early morning, the patient is often brought to the table fasting, his last meal having been taken overnight. Some anæsthetists consider this arrangement too drastic; weakly children, for instance, become worn out and faint, and so do delicate adults if food is withheld for

many hours. The better plan is to allow light nourishment in the manner and at the time indicated above. No solids must on any account be given before an anæsthetic, and for that matter no liquid other than the tea (or beef essence) already allowed. *Atropine* is very often ordered now before anæsthesia, to lessen pharyngeal secretion; occasionally it causes intense dryness of tongue and throat, and patients beg for a sip or two of water. This may be conceded if a distinct promise is made not to swallow any. In America, water is allowed freely up to within three hours of the operation. This approximates very nearly to our own custom.

I have said nothing here about the special sanitary toilet of the patient for the operation proper. That falls within the nurse's regular, as apart from her anæsthetic, duties. One word about preliminary hypodermic medication. This should only be given on the express order of the anæsthetist, the operating surgeon, or the ward sister, and, if by the last named, only when authority has been delegated to her. If a routine has been established for all operation cases to have atropine, then the injection is made for each case one half-hour before that particular case enters the anæsthetising room. In this way the rule works without a hitch.

The combination of *morphia* with atropine is very general. Instances occur where morphia should be omitted. Under these circumstances

the ward sister will either use her own discretion, or, preferably, refer the matter to the house-surgeon in charge.

Hyoscine, scopolomine, and other narcotics are often used for hypodermic administration before operation. Personal experience guides the selection.

Nurses should know the *rationale* of preliminary medication in surgical anæsthesia. Atropine is given in doses $\frac{1}{100}$th gr., $\frac{1}{150}$th gr., and $\frac{1}{200}$th gr. It acts (*a*) as an antidote to the cardio-inhibitory effects of chloroform, and so is an element or factor of safety when this drug is used; (*b*) it diminishes secretions generally, but does not affect the urinary secretion; (*c*) when given in combination with morphia its physiological antagonism to it probably neutralises the toxicity of the former. Absence of pharyngeal secretion is naturally a great aid to etherisation. Without atropine ether could not be given to many patients at all.

Morphia, either alone or in combination, helps to quieten nervous patients, athletes, alcoholics, and the full-blooded. It is contra-indicated in (*a*) the extremes of life, (*b*) in acute or sub-acute nephritis, (*c*) in very feeble patients, (*d*) in sufferers from respiratory affections. Children under seven are not fit subjects for morphia, nor are old people (seventy and upwards). In regard to group (*d*), very slight bronchial or asthmatic states may be ignored. While, therefore, much

care must be observed in ordering morphia, atropine medication may be allowed in nearly all cases.

Before removal of the patient to the theatre, long woollen stockings must be fitted on, and

Head Band (B. & W.) in Process of Adjustment.

coverings of warm blankets closely folded over and under the body. This will ensure a transference free from exposure. Pillows must be arranged in a comfortable position for the head; all noise and bustle must be avoided. The nurse in charge will, of course, accompany the patient

on the short journey, and see that there is no needless loitering *en route*. Waiting for lifts and attendants is annoying, and can be guarded against by method and discipline. Treat all patients with equal care, whether they be princes or paupers. In fracture cases use great care in lifting or handling the limbs; pain is easily given by awkward and unbalanced efforts at removal from the stretcher to the operating table. In placing the patient in final position, care must be taken to distribute the weight fairly equally among assistants, and to act all together when the word is given. In many cases patients can help themselves and so save the bearers from dealing with absolute dead weight. Dental plates, trinkets, etc., should be removed before leaving the ward. Sacred emblems worn round the neck may be left, unless the operation involves this region of the body.

CHAPTER V

Duties of Nurses before Induction of Anæsthesia and Afterwards.

We have seen that many details have received attention prior to the removal of the patient from the ward. First of all, the nurse should arrange the patient's head in a comfortable position. Too often the weight is borne on the occiput alone, no allowance being made for supporting the neck. Most sand-bags are atrocious substitutes for pillows; they are too hard and unyielding. Large bath towels answer much better. They can be rolled to the required height, and are sufficiently firm without causing discomfort. Covered with mackintosh sheeting, they will remain clean and dry.

Constrictions about the neck, waist, and wrists must be removed. Neck-bands buttoning behind are very liable to escape detection. Nothing must be allowed to interfere with free respiration. Unless this is seen to at the beginning, much trouble may ensue at a very early period of the induction, especially in stout plethoric people. The nurse is responsible for carrying out these preliminaries, but the anæsthetist must satisfy himself by personal inspection that her

duties in this direction have been properly performed.

Arrangement of Arms and Hands.—If the night-gown fits too tightly at the arm-pit, the whole sleeve had better be slipped from the arm. The hands should be held clasped, with fingers interlocked, over the lower chest wall. At this

ROLLED BATH TOWEL IN POSITION AS PILLOW.

point they will cause no pressure. When unconsciousness is well established, both arms and hands will be disposed according to the wishes of the surgeon. It is usual to place them extended along either side of the body, the fore-arms semi-prone, with palms resting flat on the table and gently tucked into the flanks. The

whole arm is thus secured in the body coverings. These indications apply to the patients lying supine. For many operations the position of arms and hands will vary to suit the needs of the case. They must never be allowed to hamper the operator. That is the great desideratum. Very often a single loop is fixed round the wrists and the arms secured to the under surface of the table. Sometimes this will cause great congestion of the hand. When this occurs the loop must be loosened or removed altogether. When the *upper arm* is allowed, through negligence, to be crushed under the body, as, for instance, in the lateral position, paralysis of the musculo-spiral nerve may be caused—a very regrettable *contretemps*, and one which cannot be excused. There are two positions in which the arm may receive undue pressure, unless precautions are taken to avoid it—one the kidney position and the other the semi-prone. In the former the lower arm lies flat on the table, while the upper is elevated and supported on a special stand fixed to the table. The correct posture is to be arranged deliberately and with proper precaution. The same remark applies to the semi-prone posture, which is not quite so easily dealt with. The anæsthetist will obviously direct everything and see that the right steps are taken.

Further Observations.—Body coverings must be accurately and smoothly arranged; the feet and legs seen to be in a position of easy extension,

encased in the long woollen stockings already spoken of. Perfect quiet and silence must be enjoined from this point onwards. Nothing distracts the attention more than noise and idle talk. Moreover, as the patient is already probably drowsy, and almost certainly suffering in some degree from nervous anticipation, it is the clear duty of everyone present to realise the situation and to act accordingly. Every operation, however slight, is a serious matter from any point of view, very serious for the patient, who trusts his life to another, serious for the anæsthetist and for all who act with him. It is the first step that counts, aye! and the last, too, in matters of such import. A good beginning is so often the forerunner of an easy sequence that it has become almost a truism in surgical anæsthesia. Let us remember that always!

During the Anæsthetic Sequence. — Beyond standing by generally, and being vigilant and rapid in executing any orders given, the nurse's duties, so far as the anæsthesia is concerned, are almost nil. If needed, she will be summoned by the administrator. It may be that he will require some instrument, a towel or swab, perhaps even a refilling of chloroform or ether bottle—in fact, numerous small needs arise which must be attended to by a nurse without delay. On the other hand, a patient may give trouble; struggling may have to be met with a firm hand. Indeed, many firm hands are occasionally required

to overcome strong men. There is a right and wrong way of holding down truculent patients. Nurses should stand, one on either side of the table, on a level with the patient's chest. In this position they can seize and hold down the wrist from a point of vantage. The force is exerted from above downwards, and is therefore much greater than when directed from a point in front. There is a second reason why this method of tackling is better. If the patient resists strongly and threatens to get out of hand, extra pressure can be brought to bear upon the upper arm and shoulder. In holding struggling patients, remember to *avoid pressing anywhere on the chest walls.* This is a rule of vital importance. The untrained are liable to ignore it, and often subdue their victims by solid and combined lung pressure! Assistants will also control the legs and thighs. You may fall bodily across the thighs without doing harm, but never across the chest walls.

Removal of Patient from Theatre.—After operation the patient is prepared for removal to bed. This may entail traversing long corridors and somewhat draughty passages. Therefore, every endeavour must be made to secure all coverings with great precision. If care were called for in taking the patient *into* the theatre, double precautions are needed in taking him *out* of it again. When ether has been freely used, great moisture of skin is a prominent symptom, and patients must be closely, equally, and absolutely wrapped

in thick blankets. I cannot emphasize this point too strongly. Nurses not infrequently fail in this detail, and the patient then runs risk of developing bronchial and other troubles. Once placed on the stretcher, the patient, for the time being, is under the care of the nurses and attendants. The nurse in charge must attend to the pose of the head, and see that there is no obstruction to breathing. If vomiting occurs, she must stand by and support the head and shoulder in a position to allow the stomach contents to be easily and safely voided. Again, the patient may become deeply cyanosed through clenching of the jaws. The nurse's clear duty is to press up the angle of the jaw, and, if necessary, open the mouth to restore a free airway. Ordinary care and watchfulness will obviate many of these minor post-anæsthetic difficulties.

Sudden changes of position, such as violent flexing of the head or carrying the patient doubled up, are to be deprecated after severe surgical procedures, especially in states of deep unconsciousness. Instant and dangerous collapse may result. The obvious moral is to keep the patient, as far as possible, on an even keel—quite flat—and to move him from stretcher to bed exactly in this position.

Post-Anæsthetic Vomiting.—After most general anæsthetics, vomiting in some degree must be expected. It is not generally prolonged or unduly severe; on the other hand, many patients within

an hour or two of removal to bed begin to vomit, and continue with very little intermission for twenty or twenty-four hours. Such persistence produces at times, in frail subjects and in the old, an alarming condition of physical exhaustion. When the patient has been well prepared for operation, vomiting, as a rule, is not violent and continued; nausea more or less severe is very frequently present, associated with retching.

Measures of relief must be devised to deal with these various symptoms. Small sips of *hot* water—not lukewarm—or, better still, a good draught of hot water, will often prevent or arrest nausea and vomiting. Sucking small pieces of ice sometimes acts as a palliative. Again, the application of half a mustard leaf over the pit of the stomach frequently does good. It should be retained as long as possible. "Capsolin" (P. D. & Co.) is a valuable substitute. Spread on lint it acts as a powerful counter-irritant, and does not blister the skin. For very severe attacks of vomiting the stomach should be washed out.

Obviously, when nothing can be retained, rectal feeding must be tried, and, as stomach tolerance is re-established, stimulants—champagne or brandy—may be given by the mouth, to be followed later by light jellies and essence of beef or chicken. What may be described as normal post-anæsthetic vomiting, occurs after most operations on the nose and throat—removal

of tonsils (old method), adenoids, turbinectomies, and operations on the antrum. The blood shed and swallowed during these procedures must be voided again. Patients vomit either on the table before removal, during passage to ward or room set apart for them, or at some variable time before or after consciousness has been regained.

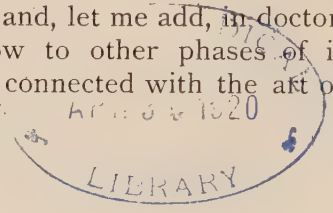
Parents and others, especially in private houses, should be warned about this subsequent voiding of the shed blood; if this precaution be omitted much needless alarm may be caused.

Hiccough is at times a very troublesome resultant of anæsthesia. If long continued and unrelieved it causes much distress and exhaustion. Hypodermic morphia is a valuable remedy. Hot green tea is also very useful.

Perchance, many things written in these pages will appear to you to be elementary and most self-evident. It is precisely because they are elementary and self-evident that they are often missed. Nothing is so dangerous as pure routine without a modicum of sound judgment and good common sense. It tends to stifle initiative and begets mental stagnation. In the exercise of your calling you will be for ever learning, and nothing makes for efficiency better than a return, at intervals, to first principles and simple rules of guidance. If we, who are engaged in works of mercy and healing, rest too long upon our oars, we drift away on sluggish currents of

unconcern. And nothing is worse than unconcern in nurses, and, let me add, in doctors too.

And now to other phases of interest more intimately connected with the art of anæsthesia.



CHAPTER VI

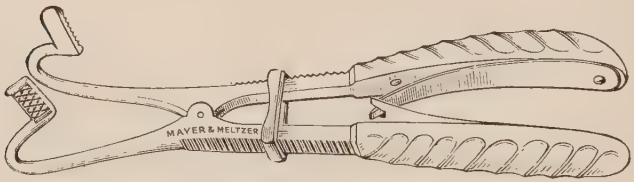
Observations on the Anæsthetic Sequence.

What are the chief things that will claim attention in an anæsthetic sequence? First, the quality of respiration; second, the state of the circulation; third, the state of the pupil.

Closely associated with these are the colour of face, and the degree of warmth to be noted in extremities.

Respiration.—In the early period of narcosis the breathing is obviously largely volitional; as yet the patient is conscious, or only in a subconscious or semi-dazed condition. In this state breathing is usually hesitating or shallow, due in part to natural intolerance of the nasal and pharyngeal mucous membrane to an irritating and pungent vapour. As tolerance is established, so in proportion does breathing become deeper and more regular. This tolerance may be delayed by violent obstruction—clenching of the jaws and deliberate holding of the breath—or, again, sobbing in children will interfere with adequate respiration. In all these circumstances you will note that the anæsthetist proceeds with great caution, but with deliberation, feeling his way like a leadsman in shoaling water. He hurries slowly. Gradually easy, rhythmic, full

respiration sets in, the corneal reflex is suitably diminished, muscles hitherto tense and rigid relax, and the patient is rapidly approaching the point when the operation may be begun. But other events may also happen. Obstruction may beget cyanosis, and cyanosis will always mean recourse to gags and separation of the jaws, if they be locked, in order to clear the airway. The tongue, too, must be seized and drawn forward. Such manœuvres take time. Coincidentally with these undesirable happenings, the anæsthetic having been for the moment withdrawn,

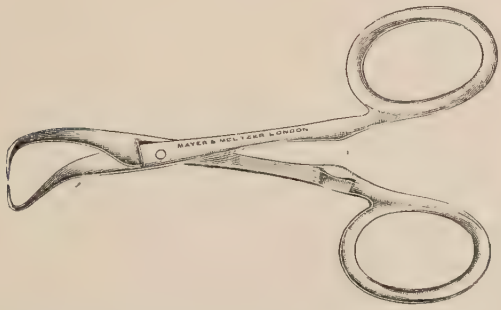


Fergusson's Gag.

the patient may complicate matters still further. He may attempt to vomit. The nurse can do nothing. The anæsthetist must restore order out of chaos. He realises, with trained intuition, the necessity *primarily* of restoring the airway as rapidly as possible, and then of attempting to prevent vomiting.

This is sometimes easy, especially if the patient has been well prepared. At other times, however well prepared, there may be a large amount of salivary secretion flowing back into the gullet

and stomach, which must, in very light recovery, be voided. Better so at the beginning than at the middle period of the sequence. Some delay is now inevitable. You see, in these matters it is, after all, only a small proportion that give marked trouble. Were it otherwise, practical anæsthesia would be horror, and anæsthetists, as a class, broken down neurotics. Happily,



Towel Clip, suggested as a Good Form of Tongue Clip.

history tells us another tale entirely. How is respiration to be tested? By watching the movements of the chest walls, hearing the breath sounds, and, if neither of these signs is apparent, by watching the movements of the diaphragm. Coverings are so arranged sometimes that frail breathing cannot be observed. The anæsthetist, may be, is crowded out. True, he may bend down, and, with ear to mouth, hear the breathing. He can, and should, always watch for movements

of the diaphragm. For this purpose you must see that the way is clear for observation.

Imperfect Respiration.—Any departure from normal breathing may be called imperfect. It is largely associated with the shallow respiration so largely seen in the induction of anæsthesia. Certain forms of intercostal paralysis from cocaine poisoning produce shallow breathing. In fainting, or threatened collapse from blood loss or shock, imperfect breathing is marked, and, indeed, the same phenomenon occurs in many states of the body, where blood pressure is much lowered and the circulation therefore with difficulty carried on. Imperfect or shallow breathing is a late sign in prolonged and severe operations, and tells eloquently of lowered vitality and waning strength—"the last signal before surrender." The treatment, naturally, for this abnormal condition depends upon the cause. (1) Oxygen where pallor and blood loss are present. (2) Pituitrin (a preparation of the pituitary body) where blood pressure is very low and there is danger of further rapid exhaustion. The situation is, as you see, somewhat complex, and calls for measures *au fond*. Pituitrin, for instance, being hypodermically injected into the leg or arm, raises the peripheral blood pressure, and so stimulates the heart. Stimulation of the heart naturally incites the lungs to greater activity, and so breathing is deepened and regulated. A change to (3) ether from chloroform will some-

times act marvellously. Breathing, hitherto very shallow and imperfect, will soon show signs of improvement. Moreover, the substitution of a safe for a more toxic agent enables a greater freedom to be exhibited in administration with less anxiety.

Obstructed Respiration.—There are many causes for this. We may consider some of them in detail.

Falling back of the tongue during induction with chloroform may quickly place the patient in great danger. It must be met at once by seizing the tongue and drawing it forward out of the mouth. This is liable to occur when the lower jaw is widely stretched by a Doyen gag, preparatory to tonsillar enucleation, especially if no counter-pressure is made by supporting the angles of the jaw at the same time. The tongue varies in size; in some patients it bulks large and flaccid in the mouth, lying well back and blocking the airway almost completely; in others improper posture will cause it to fall back by simple gravitation in the unconscious subject. For this reason it is wise always to have the head turned slightly to the right or left, so that the tongue may lean towards one or other cheek. By this means a fair airway may usually be established.

Retraction of the tongue, with the added factor of clenched teeth, is another complication that may, from time to time, arise. In strong men it

will quickly lead to cyanosis unless promptly relieved. The old device of wedging open the mouth is futile. So also, as a rule, is the attempt to force the jaws apart with gags. The better plan is to pass a long blunt-pointed probe through a chink or gap in the teeth, right back to the pharynx; the patient almost invariably opens the mouth, while a gag, held ready, is quickly placed in position. Trained nurses will be of great use in rendering aid.

Cyanosis or Lividity.—The presence or absence of cyanosis does not depend on carbon monoxide. The blood receives its colour from the corpuscles, and the colour depends on the amount of hæmoglobin in the individual cells. When hæmoglobin is exposed to oxygen, oxyhæmoglobin is formed. The colour of the blood depends entirely on the amount of oxyhæmoglobin present. A reduced amount of oxyhæmoglobin produces duskiness. A still greater reduction produces blueness or lividity. There are many other terms used in connection with the physiological and chemical aspects of anæsthesia, but their inclusion here would be out of place. Suffice it to say that the resultant of certain combinations, and among them one or more of the conditions noted above, brings about a complication which we must now refer to.

Arrested Breathing.—As far as the nurse is concerned, any interference with respiration is serious, and must be dealt with as such, and not

regarded from the point of view of the administrator. That is another matter. The nurse knows and has been taught that any patient who stops breathing is in a dangerous state. She cannot be expected to differentiate between a condition which looks very bad, but is comparatively safe, and one that is desperately hazardous.

When called upon to decide for *herself*, the nurse's first duty must be to revert to artificial respiration, and to do so promptly.

There are various methods in use, but for all practical purposes in anæsthesia a complete or modified Sylvester is the one naturally selected. Patients are generally in the supine posture, and so ready placed for the method noted above. Quite early in a threatened case, the ribs on either side should be pressed firmly and symmetrically ten or a dozen times, say, in half a minute—this will often stimulate sluggish breathing and obviate further trouble. If it fails, immediate recourse must be made to fuller and more balanced methods. The patient must be laid with head lowered in the sloping or Trendelenberg position, the tongue held forward by clip or suture. Both arms must be gripped at the elbows by the open palms of the assistant standing behind the head; they are carried outwards and backwards till they are stretched behind the patient's head, and then brought forward again with the reverse sweep to the sides of the chest, against which they are fairly

pressed for a second or two before being relaxed. This manœuvre must be repeated sixteen or eighteen times a minute, and must be continued by relays of helpers until automatic breathing sets in, or conversely, until hope is abandoned. The process is a tiring one, but most valuable, and numerous cases tell of success even after two hours' labour.

Remember, then, that artificial respiration is by far the strongest card to play when the game is going against the patient. Restore the breathing as quickly as possible. That must be a cardinal axiom for nurses. Sometimes a minute gained is of priceless value, and will make all the difference between eventual safety and disaster. Obviously, while these measures are in progress, the operation itself, whatever it may be, is suspended, and not resumed again until the crisis is over.

Mention may be made here of two mechanical devices for inducing artificial respiration: (*a*) the pulmotor, and (*b*) the lung motor. The former works automatically and is capable of fully distending the lungs. Air is forced in and out, but care must be taken to prevent it from entering the stomach. This is achieved by pressing two fingers against the windpipe, at the level of the pomum Adami. The lung motor is easier to handle. It delivers a given volume of air at each stroke, which can be graduated to suit varying lung capacities. Both instruments

should be held in reserve in well equipped theatres. As they take a little time to rig up, ordinary methods should be started and kept up until one or other appliance is ready.

CHAPTER VII

Observations on the Circulation—Shock, etc.

During the course of an anæsthetic sequence many opportunities will occur of noting the varying state of the arterial circulation. Thus, at the beginning it is nearly always accelerated—the true physiological reaction in normal subjects, and one which we regard with complacency and even with satisfaction. With much struggling and congestion during the act of vomiting, the pulse varies sometimes within wide limits; it may become tumultuous and irregular, much diminished in volume, and difficult to count at the wrist. With the gradual restoration of equilibrium it will be noticed that these temporary and erratic symptoms have disappeared—the heart regains its tone or balance, and the pulse once again resumes its even course. These phenomena are never disregarded by the administrator; they are adequately arranged for and dealt with. They should be noted carefully by nurses in training, and their true significance carefully explained. Nurses in attendance often hold the patient's hands and wrists from the beginning. If this is allowed they will have occasion, at fair intervals, to study the conditions described, and to verify, by personal contact and

observation, their accuracy. Personally, I dislike the patient to be touched during induction, and prefer to rely upon suggestion and interlaced hands alone.

Blood Loss and Shock.—Long operations on the trunk and abdominal contents tend to produce a fall in blood pressure. In many cases there is marked blood loss, the patient is blanched, and the pulse rapid and feeble. As you know, operations cannot be abandoned when half done, perhaps because of the interposition of shock, surgical or anæsthetic. Means must be found, and found rapidly, for dealing with the crisis. Treatment in these conditions will resolve itself into stimulating and strengthening the heart muscle, and in attempting to make good the blood lost.

For the former we give strychnia, either subcutaneously, or pituitary extract. At one time strychnia was much vaunted and universally given for shock. Recent physiological research has shown that it is largely valueless. It acts for the moment, but exhausts the medullary centre subsequently. Ether injected into the tissues has only a transient effect, its volatility being so great. Pituitary extract therefore remains. As we have already said, in another section, it raises the peripheral blood pressure—that is, at a distance from the heart—by causing contraction of the small vessels and so stimulating the heart. The effect of a single injection will last for

fifteen to twenty minutes; the pulse at the wrist will be felt to improve gradually and to remain improved.

Sterilised salt solutions are invaluable in shock arising from grave blood loss. They are administered in various ways: (*a*) by the rectum; (*b*) by hypodermic injection into the subcellular tissue; (*c*) intravenously. The technique needed for the rectum is simple. A long vulcanite rectal tube is attached to the rubber tubing fixed to the glass funnel holding the warmed solution. The nurse carefully inserts the vulcanite tube into the rectum, while the controlling tap is released and fluid allowed to run in slowly. Another nurse holds the container four or five feet above the level of the patient's body. About 1½ pints should be run in before the tube is removed.

The same procedure, slightly modified, is adopted for subcellular infiltration. A considerable area may be invaded by the entering fluid, and the presence of a raised surface will show what progress is being made. The application of these two methods will often devolve on the nurse, and therefore it is well that she should be familiar with the details.

Intravenous saline is administered by the anæsthetist or a student acting under him. Sometimes a formal dissection is needed to secure a clear entry into the vein. Intravenous infusion must be carried out continuously until the patient shows unmistakable signs of recovery.

Saline solution introduced into the body by this route causes a rise of blood pressure all round. It has also a stimulating effect on the vaso-motor centres.

Anæsthetic Shock.—Sudden pallor and dilatation of the pupil, with more or less coincident arrest of breathing and extreme feebleness of pulse, are symptoms which betoken anæsthetic shock. Violent handling of large, sympathetic areas will often cause these symptoms, under chloroform especially. And there are causes beyond these which we need not discuss, as they have no bearing on the nurse's outlook on this subject. Among the many measures indicated in treatment are the following, given in order of merit: (*a*) lowering of the head, (*b*) artificial respiration, (*c*) sudden flicking of face and bared chest with damp cloths, (*d*) stretching of sphincter ani, and (*e*) in small children suspension by the heels. No time can be lost in deciding what to do. The patient is, therefore, placed in position, as directed in a former section, for artificial respiration, and the manipulations are begun. While these are going on, other hands may prepare hypodermics and wet cloths, and whatever else can be thought of at the moment. Should these measures fail, it will be well, as a final effort, to try the Lewis pendulum swing. Much used in America, some very striking successes have been reported. The inventor's own words will afford the best description.

"The patient should be suspended by the fully flexed knees, and swung forcibly from side to side for a period of from one to two minutes. Suspension is best accomplished by the operator's forearms so grasping the patient's knees as to hold the anterior surfaces of both legs against the operator's chest, allowing dependence of thighs, trunk, arms, and head of patient facing away from operator. Except in children, it is necessary for the operator to stand upon a dais, box, or chair of sufficient height to permit full pendulum swing of the patient from side to side without contact of patient's arms or head with the floor. Swinging should be done as vigorously as possible to secure by centrifugation a forcible distension of heart and intracranial vessels. The suffusion of neck and face, which is brought on by this swinging, is the index by which to judge the effect of centrifugation." The description is clear enough; in adults, however, of any bulk it would be difficult to assign the duty of swinging to the ordinary nurse. Children could be dealt with more readily. From a record of cases actually treated, we learn that patients absolutely moribund recovered, and that the operation in progress was subsequently completed. I am not aware that the method has been tried in this country. It is evidently valuable in extreme crises, and, therefore, well deserves serious consideration and adoption.

Observations on the Pupil.—Difficulties at once

present themselves if we attempt to discuss the conduct of the pupil under narcosis, dissociated from and independent of the circulation and respiration. As, however, the object of these lectures is to give elementary instruction in certain phases of anæsthesia, and to help you to appreciate the value, so to speak, of the obvious, certain practical points about the conduct and changes that take place in the pupil must suffice. And first, then, as to *pupillary dilatation and contraction*. In the conscious subject you will have observed that, if the eyes be tightly closed and then suddenly opened, on the instant of exposure to light the pupils will contract. They react then very quickly to light. Preliminary medication with morphia will cause the pupil to contract and to remain contracted often during deep stages of anæsthesia—a serious drawback at times. If morphia be withheld, the pupil is, as a rule, slightly contracted to commence with, but as we proceed various changes may occur.

With too light an administrator it may dilate. This will be revealed to us by other symptoms—brisk lid reflexes, body movements, phonation possibly, and the knowledge that very little anæsthetic has been given. Later, when narcosis has been well established, dilatation of pupil may synchronise with three distinct conditions: (*a*) blood loss, (*b*) handling of certain nerve trunks and sympathetic plexuses, (*c*) or from over-dosage. If we are undecided as to the cause, we withdraw

the anæsthetic and watch for further signs. In over-dosage the pupil remains dilated. If nerve shock is the cause, the pupil will gradually become smaller again. These, briefly, will be guiding lines or indications.

The Lid or Corneal Reflex.—The conjunctiva is not nearly as sensitive as the cornea. For practical use, therefore, we ignore it. It is quite possible, in the fully conscious state, to touch the conjunctiva either of one's own or another's eye, but never the cornea. Under the anæsthetic the corneal sensitiveness gradually lessens, and in time, if narcosis is pushed, is lost entirely. We speak of a brisk corneal reflex, a dull reflex, or a lost reflex respectively. How do we elicit a corneal response? By placing the bulbous or fleshy end of the index or middle finger on the lower central portion of the upper lid, and rolling the lid smartly upwards, lightly touching the cornea at the same time.

If this movement is strongly resented by rapid closing of the lids, we know that the reflex is very active. If, on the contrary, there is slight resistance, we know the reflex is much diminished. Appeal to the lid reflex should not be made too often; once in five or six minutes will suffice. One eye should be selected for observation, while the other acts as a reserve or control.

It must not be assumed that the condition of the corneal reflex is an absolute, or even a sure guide in all cases. There are many modifications

and exceptions to be noted in practice. You must content yourselves with the broad principles that govern the majority of cases. What has been said here may prove valuable should you ever be placed in temporary charge of an unconscious patient. There is one symptom connected, not directly with the cornea or with the lid reflex, but rather with the state of light anæsthesia, and that is the presence of watery secretion at the inner angle of the eye—the inner canthus. It is a minor sign, but worthy of attention.

CHAPTER VIII

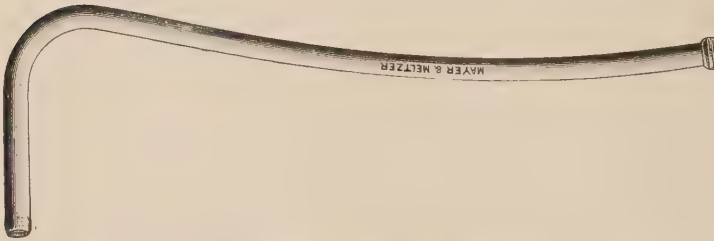
Observations on Throat Operations.

Most nurses, even when fully trained, are not quite familiar with the peculiar duties that are often required of them in operations on the nose and throat. This is not to be wondered at, seeing how few have special opportunities of acquiring knowledge in this branch of the surgical art. Experience alone is lacking, and experience cannot be gained by hearsay. An easy familiarity with details is, we know, essential for the smooth performance of duties, whether on the part of surgeons or assistants, and nurses, more than other people, will realise the truth of this statement, as it applies to themselves. In throat work, one nurse with full knowledge of her duties will prove more useful than two or three beginners, however ready and willing these latter may be. Her arrangements are more complete, she can anticipate with more precision, and, above all, she can and does economise both time and labour in the varied demands made on her. She must be ready to help the surgeon, to act frequently as his sole assistant, and, if not so engaged exclusively, to fetch and carry generally. In private practice she acts usually without added help, and so upon her alone devolves the

duty of preparing the room, setting out sterilising bowls and instruments, arranging dressings, lotions, sponges, swabs, and a hundred and one other items. In addition, she must attend to the final toilet of the patient, and even sometimes —though this is rare—pack the nose in certain cases. Then, again, she must have abundance of sterilised water ready in covered cans, towels for washing the hands, masks and gowns for the surgeon and anæsthetist, and finally a fair supply of chipped ice for post-operative use. True, she can draw upon the domestic circle for help in many of these preliminaries, and so lighten her labours. None the less, she is responsible for everything, and must satisfy herself that all has been well done. Obviously, method and experience are essentially needed for duties such as these. Her activities do not end here. She must have intimate acquaintance with the instruments used in the specialty, and know how to deal with them after use. Even the cleaning of gags, forceps, and tonsillar guillotines is not always easy. Nowadays bronchoscopy and æsophagoscopy are much to the fore. They each have their quota of instruments; these, too, require assimilation at the hands of the nurse. So you see, without labouring the point too much, it is quite evident that nurses destined for distinction in throat and nose work must be well equipped for their task, and have really much to learn. Lest this grim record should alarm you,

let me hasten to add that practice soon makes perfect, and that the old adage is true here as elsewhere : "Labour conquers everything." A few practical hints may not be amiss in regard to certain other matters.

Sponges and Sponging.—While many operators sponge the throat at very frequent intervals, the vast majority content themselves with an occasional swab out, or refrain altogether until the end of the operation. Ten years ago



Bent Metal Tube for use with Junker's Apparatus in Mouth Operations.

operations for adenoids and tonsils were much more prolonged than they are to-day, and bleeding often obscured the view so much that a definite pause was needed, now and again, to clear out the shed blood. Under a newer, and, as some say, a better dispensation, enucleations are rapidly effected and adenoidal pads deftly curetted, in the twinkling of an eye. There is no time for the shed blood to embarrass or obscure. Nay, more, there is no shed blood at

all with experts of the supreme school, and so, of course, no sponging. However widely opinions may differ as to technique, all agree that the less sponging done the better.

How to Prepare a Throat Sponge.—Various materials may be pressed into service—marine sponges, small mops, layers of gauze rolled into oblong shape, and cotton wool. Small marine sponges are unquestionably superior to anything else for pure throat work, and for these reasons: They are put up dry in hermetically sealed cartons containing two, four, or six sponges respectively; they can be opened just before operation and soaked in cold sterile water; they are easily moulded into shape; they are soft, elastic, and porous—three prime desiderata which, in my view, make them invaluable. As to subsequent cleansing, in hospitals where waste is properly discouraged, elaborate means are taken to repurify and sterilise soiled sponges, so that they can be used again and again. In private the prime cost is so trivial that used sponges are always discarded.

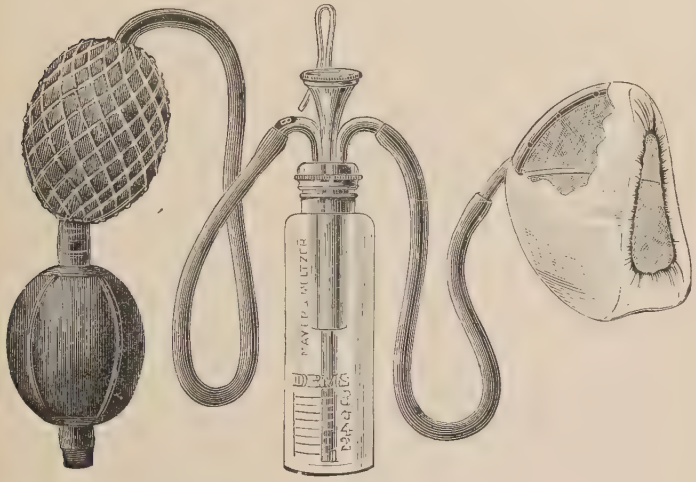
Sponge-holders.—Holders of all kinds exist. Some are good, some bad, and most indifferent. They are two-pronged and three-pronged, clamped tight, when the sponge is *in situ*, by a sliding metal collar, and either straight or curved at the sponge-carrying end. They are, as a rule, light and cheap, foreign made, and too flimsy in construction to last long. The three-pronged model

is not desirable from any point of view; it contains too much metal, and may, if improperly fitted, cause actual damage to soft tissues; it is, besides, too rigid in opening to admit the sponge, and, therefore, proper adjustment is nearly always impossible. A fine-toothed, double-pronged holder answers best. *Sponge-holding forceps*, strong in construction, are straight, serrated for gripping, and fixed at the handle like artery forceps. The absence of any curve is a drawback. On the other hand, they are sometimes very useful in tonsillar bleeding, as their strength enables the assistant to make very firm pressure on the desired spot. They can be readily disengaged, which is a distinct advantage in many emergencies.

The nurse must be warned that the metal collar in all sponge-holders, as distinct from sponge forceps, often works loose, and must therefore be tightened *after each rinsing*. This is a most important practical detail. If it is omitted, the sponge may easily become detached in the patient's mouth, a *contretemps* that looks, and may be, alarming.

Methods of Fixing Mops and Sponges.—The whole object in fixing mops or sponges should be to so arrange them that no injury can be done to the soft tissues. Frequently this appears to be forgotten. Not uncommonly the mop or sponge is seized haphazard, leaving the metal prongs uncovered, and the mop bulging out

large and flabby on either side. Such an arrangement needs only to be mentioned to be condemned. It is not only wrong in principle, but harmful in practice. If sterilised mops are used, proceed as follows: Grip the centre of the under surface firmly with the prongs and drive home the metal ring; this will make everything



JUNKER'S CHLOROFORM APPARATUS.

secure and taut. The mop now presents a smooth, even surface all round, and, when pressed against the tissues, will effectually prevent the metal arms from coming into contact with them. The mops must, of course, be fairly small. Or another plan may be tried. Mould the mop pear shape, and grip the lower third or tapering

end with the prongs. Whichever method is adopted, the result will be that a soft cushion of

THE LEFT-HAND PICTURE SHOWS THE INCORRECT METHOD, THE RIGHT THE CORRECT METHOD OF FIXING MARINE SPONGES.

considerable bulk will always interpose between the prongs and shaft and the tissues.

With *marine sponges* proceed in this way: Roll the sponge into cartridge shape, grip it just below the middle in the long diameter, and secure as before. The free upper portion of the sponge will then present a firm, semi-elastic pad, which will obviate any danger from prongs or metal shaft. Sponges once fitted should not be unshipped again, unless they work loose or become unshapely. If this occurs they must be remoulded and refixed. For private cases, six sponges, previously fitted, will be needed. A special nurse, carefully sterilised, is told off to attend to the sponges. As each soiled sponge is discarded, she immerses it in a bowl of sterilised water, and rapidly squeezes out the blood with one hand, while holding the shaft firmly with the other. In this way a regular succession of clean sponges is maintained. After each separate rinsing, the nurse must test the metal ring to see that it is holding well. This detail is most important. Simply shaking sponges under water is worse than useless. They become glutinous and sticky from the buccal secretions, and only vigorous and firm squeezing will render them fit for service. Moreover, they fray out easily when treated in this manner, and always become detached from the holder.

One disadvantage with sponge-holding forceps is that they present a large metal surface. It is difficult to get a neat-shaped pad with them. Against this there is no remedy, but careful

moulding, as already explained, will produce a very respectable result. We speak of moulding and rolling into cartridge shape, and gripping in long diameters, etc., etc., and beginners may think that deliberate technique of this kind must perforce mean wasting much time. As a matter of fact, these things can be done automatically and rapidly in a very short time, and—they are worth doing!

Reasons for Sponging.—In the simpler operations on the throat, namely, for the removal of tonsils and adenoids, sponging is done for the purpose chiefly of clearing the view, and not for the purpose of arresting hæmorrhage. Some patients bleed a good deal, and the surgeon is thereby hampered if he cannot see what he is doing. On the other hand, tonsillar enucleation is often effected with great deliberation with a view to minimising blood loss. Then, as each tonsil is removed, a firm pad carried on a holder is pressed into the gap left behind, and held there for an appreciable time until the site is almost dry.

The best way to clear out the contents of the mouth and throat is to pass the sponge well back over the dorsum of the tongue, and then to make a sweeping semicircular movement, the head, at the same time, being turned to one or other side, so as to facilitate easy removal. In this way secretions are forced into the hollow of the cheek, and so readily expelled at the corner of the

mouth. An attempt to clear the mouth alone by gentle dabbing will fail; most of the obstruction lies much farther back. Sponging, again, is often done to *restore cough reflex*, when this shows signs of being lost. Under these circumstances, the sponge-holder must be passed straight back to the pharyngeal wall, and then directed downwards. This movement must be repeated until the patient makes an effort to respond. Curved holders, by their shape, answer best. *Apropos* of cough reflex, though the duty of recognising its loss, partial or complete, rests with the anæsthetist, its restoration again is often due, at least in part, to the nurse's ministration. She can attend to the deep sponging, while the anæsthetist holds the gag and supports the jaw, or the process may be reversed. While attempts are being made to make the patient cough, the tongue is held in control and prevented from falling back. The administrator has often both hands fully occupied in keeping the mouth open and the airway clear, and cannot do the sponging himself. Then it is that a well-trained nurse is so useful as an aid.

The approaching loss or serious impairment of the cough reflex is heralded in no uncertain manner. *Fine* or *coarse crepitations* are heard with the *expiratory* sound; coincidentally, more or less, colour may become dusky or slightly cyanotic, and the corneal reflex much diminished, or even lost; at the same time, the tongue, unless

previously held, falls back, and the breathing becomes embarrassed. Watch, therefore, the breathing, and *listen* to the sound produced by *expiration*. If coarse crepitations accompany expiration, there is probably a blood clot or thickened secretion impinging on the tracheal opening beneath the epiglottis. If *fine crepitations* are heard, the threatened obstruction is probably caused by fluid blood. The return of automatic coughing may be delayed, and then another stimulus must be applied. Compress the diaphragm forcibly several times in rapid succession, just below the ensiform cartilage, *i.e.*, in the middle line. This is a very effectual remedy, and should be attempted in all cases which do not respond within a reasonable time. If blood really enters the trachea, troublesome bronchial irritation may subsequently develop. You will realise, therefore, how necessary it is to be very watchful in all prolonged operations on the throat, so as to anticipate trouble. It often happens that surgical procedures of a delicate nature are in progress when signs of danger first begin to show. They must be dealt with regardless of anything in hand. The nurse has nothing to do with any action taken. This responsibility lies primarily with the anæsthetist.

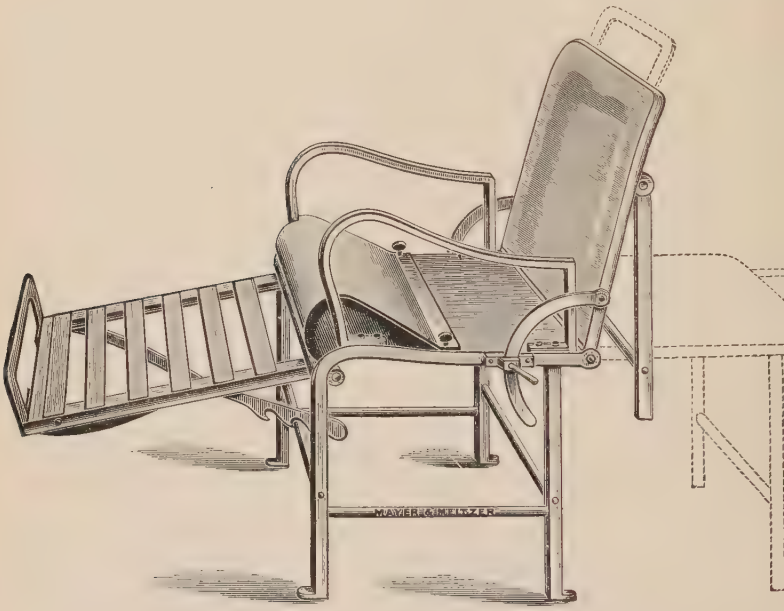
CHAPTER IX

Observations on the Preparation of Apparatus, etc.

Upon the theatre sister and nurses certain duties devolve, which will be briefly considered. The anæsthetist's table will require a careful overhaul before all operations, so that everything likely to be needed will be in place. Bottles for the various mixtures must be clearly labelled, old contents emptied, and stoppers examined and tested. Adequate supplies of chloroform and ether must be arranged in order or placed ready to hand. Gags of different patterns and sizes should be sterilised and hung on the table rails. Masks, tongue clips, hypodermic needles, and vials with appropriate narcotics, fitted sponges, bowls, spare lint squares, and, finally, an oxygen cylinder mounted for use—all these and any additional apparatus at will must be laid out in readiness. A stethoscope and Junker's drop bottle will complete the anæsthetic armamentarium.

Masks are fitted ready for service, sometimes possibly by the junior probationer—to judge by their extreme attenuation! A fair margin all round should be allowed when trimming the mask, otherwise it easily slips out of position. If

flannel is used—a much better material than lint—it can be accurately secured to a plain metal framework and drawn taut by tapes run through a hem in the margin. Naturally, fresh flannel masks are used for each patient.

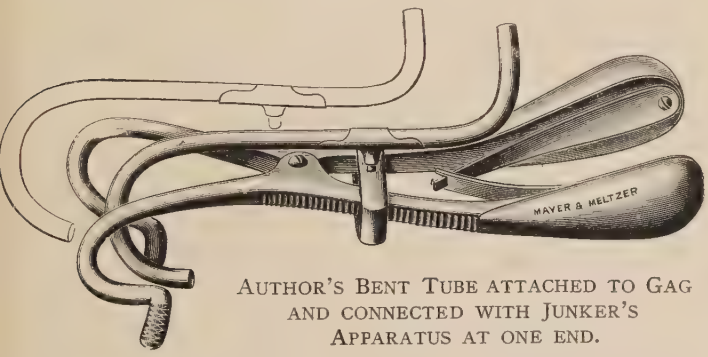


FOLDING METAL CHAIR FOR OPERATIONS IN THE UPRIGHT POSITION.

Flannel holds the C.E. mixture or chloroform well, is more porous than lint, and better suited for operations generally, as saturation, either from the narcotic or from the products of respiration, is longer delayed. Soiled flannel masks can be

washed and rewashed many times. If blood stained, they should be roughly rinsed out in tepid or cold water, as soon as possible after use. Final washing should be done with liquid soap, an antiseptic preparation for choice, and then the masks should be hung out and allowed to dry. They will shrink a little after repeated cleansing.

Gags, sponge-holders, mask frames, and tongue clips will require to be boiled after each operation. This must never be omitted.

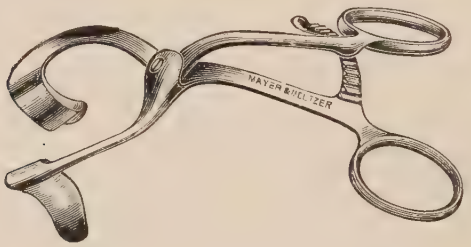


AUTHOR'S BENT TUBE ATTACHED TO GAG AND CONNECTED WITH JUNKER'S APPARATUS AT ONE END.

Gags are of various patterns. Probably the best for general use is the Fergusson model, with a bar controller. It can be easily fixed and just as easily released. Many models have ratchet fixtures, notably the Doyen. They are difficult to release, but open widely; hence many surgeons use them, to the exclusion of all others, in throat operations. Tongue clips are of all shapes. Some grip with serrated ends and bruise

badly. The best instrument for holding the tongue is the ordinary towel clip. It has sharp points, which make small punctures only. In applying the clip, care should be taken to pierce the tongue about half inch from the tip. This will give a firm hold, and probably prevent subsequent soreness.

In concluding these observations, fragmentary and discursive as they are, I would remind you that here, at least, you have the groundwork on



DOYEN'S GAG.

which to build your own edifice. There are many gaps to fill in, and long byways to traverse, before you reach the upper structures in the house of knowledge. It remains for you to do the work, and later for others to feel the benefit of your toil. I have throughout endeavoured to deal with practice rather than with theory, with the obvious rather than the unseen, with things fitting for you to do and with the doing of them.

In crises, obey loyally, and act with energy and promptitude, with self-possession and calmness,

without flurry, but always with intelligence, with courage even in the face of impending disaster. Your whole mind must be given to the thing in hand. Difficulties arise suddenly and must be met by prompt action. It is just in these moments that training tells, that the mind acts clearly, that experience counts. Your grasp of any situation will depend upon your knowledge of essentials. Cultivate the habit of thinking quickly, and then act with firmness and decision. An attempt has been made to put before you many things that have not been dealt with hitherto in your curriculum. It has appeared good to the authorities of this hospital that a wider range of teaching should be adopted for the nursing staff, and no one can question the wisdom of that decision. A knowledge of practical anæsthesia that stops short of actual administration may appear to many of you a very hollow conquest. Perhaps in another age—or even generation—you may reach your goal; things are moving rapidly nowadays. Who can tell?

CHAPTER X

On Heart Massage and other Details.

Heart failure under an anæsthetic is an event that often occurs with startling suddenness. It is usually met with in states of light anæsthesia, during the administration of chloroform or the C.E. mixture. Much scientific attention has been devoted to this matter during recent years, and Dr. A. G. Levy has done more than anyone else to point out where the danger lies. Referring to a recent case, he says:[1] "The conditions essential for the production of ventricular fibrillation were present, namely, an imperfect degree of chloroform anæsthesia as a predisposing cause, and operative procedure and struggling as exciting causes, one or both of which may be efficient.

"There are only two chances of the restoration of the ventricles from fibrillation to a normal beat, of which I am aware. One chance is that of spontaneous recovery, which is rare, and the other is through digital manipulation of the ventricles. . . . Artificial respiration alone, as generally practised, does not hold out any prospect of resuscitation.

"Cardiac massage should be performed, with-

1 Letter to *British Medical Journal*, Nov. 13th, 1916.

out undue delay, in all cases of ventricular fibrillation, once the condition is recognised. Sudden pallor and complete cessation of the pulse, followed by a phase of exaggerated respiration or convulsive movements, is a clear indication for cardiac massage, and if immediately preceded by evidence of semi-consciousness, assurance is made doubly sure. Only in cases of overdosage with chloroform, in which some evidence of respiratory failure precedes the heart failure, and in which the latter is gradual and not sudden, is cardiac massage contra-indicated, for in such circumstances artificial respiration is sufficient to restore the patient.

"The following quotations from what I have already written upon this subject defines the course to be adopted when ventricular fibrillation is established :—

> "'The only remedy so far effective is massage of the ventricles. It is not advisable to attempt this at once, for the heart may recover spontaneously; two minutes grace is all I would advise. . . . At the end of two minutes, if there is still no indication of cardiac action, open the abdomen, and with the hand compress the ventricles between the diaphragm forcibly and rhythmically. Artificial respiration should be maintained meanwhile, so that the heart may not die from asphyxia, for a measure of circulation is maintained by the cardiac compression.

"'Cardiac massage of this nature is not a certain remedy. Still better than cure is prevention, and the class of syncope illustrated above may be entirely avoided by the use of effective chloroform anæsthesia.

"'Operations under light chloroform anæsthesia entail a risk of sudden death through ventricular fibrillation, and are, therefore, in my opinion, unjustifiable.'"

I have given Dr. Levy's words almost *in extenso*. They are most valuable, and they traverse the whole situation, so much so that really nothing further remains to be said. I entirely agree with the views expressed.

Several cases have been reported in which final recourse was had to this method of treatment, and the results are encouraging. The subject is brought into such prominence now that trained nurses, at any rate, should know how the case stands. They might easily come face to face with a situation in which this procedure alone would avail to save life. It is not suggested that a nurse should ever attempt to play the surgeon, even in such a crisis, but her knowledge might conceivably be of great assistance all round.

Attendance on Tracheotomy Cases.—Much care is necessary in looking after children and others who have undergone the operation for tracheotomy. The inner tube often becomes clogged, and breathing is thereby seriously impeded.

To relieve this obstruction, feathered quills are passed through the tube, and reflex coughing is set up, which helps to clear the tubes. The outer tube, carrying with it the inner, may be forced out of the wound, either through loosening of the controlling tapes, or because of violent and spasmodic coughing. The outer tube must be instantly replaced and secured, and when this has been effected the inner tube gently pushed home. Should any difficulty be experienced in doing this, skilled aid should be urgently summoned.

The inner tube must be often removed and carefully cleansed and sterilised. For these cases a special nurse is always appointed, whose sole duty it is to watch the patient. All feeding arrangements are in her hands, and for the first twenty-four or forty-eight hours her task will be no sinecure. After that time the burden will be somewhat lightened. She must, however, never leave her charge unprovided for, and, when relieved, must give precise orders to her substitute how to carry on during her temporary absence.

Attendance of Cases involving the Mastoid and Maxillary Antrum, etc.—All dressings in *mastoid* operations are completed before the patient leaves the table, and nothing remains, therefore, for the nurse to do except to watch the patient very carefully until consciousness returns. While still insensible, the patient may attempt to disturb the dressings; the nurse must be alive to this

possibility and guard against it. Sometimes outer bandages may become blood stained rapidly; this indicates active bleeding, which must be dealt with. If the nurse is doubtful on this point, she should summon the operating surgeon if possible, and failing him, the house surgeon. Naturally, in hospital practice, the nurse in charge of the case would make her report to the ward sister first, and she in turn would act as suggested above. Mastoid dressings, in cases that follow a normal course, are changed by the surgeon personally; and not by the nursing staff, unless orders to the contrary are specially given. Sometimes a nurse with special qualifications for the task is allowed to dress the wound, but only at the express orders of the surgeon, and usually at a later stage of convalescence.

For the *maxillary antrum* the services of a well trained nurse, either in private or hospital practice, will often be required in the after treatment. When the antrum is opened from *within* the nose, lavage two or three times a day is a routine method of treatment. It can be, and frequently is, carried out by skilled nurses. The precise manner of inserting a small metal catheter into the antral cavity has to be carefully learnt, and then the rest is easy. In throat cliniques this duty is only delegated to nurses whose training has been specially supervised and whose judgment and practical experience have been tested in this direction.

Syringing the ears for the removal of cerumen and other *débris* is another duty often entirely entrusted to nurses. It can be well done or ill done. The water used should be at a temperature which the patient can comfortably bear. The nozzle of the syringe should impinge gently against the outer wall of the external auditory meatus, and the fluid is then gently but equably forced out of the syringe, not directly against the tympanum, but deflected on to it from the side wall. Anyone who, in ignorance, attempts to syringe out an ear by injecting straight at the drum will inevitably do damage.

The precise force required in using a syringe for ear wórk, and the technique generally, simple though it may appear, can only be learnt by practical experience.

So, too, with washing out the nose; all these and many other details, indispensably necessary for a nurse, are thoroughly taught in special departments of general and throat hospitals.

Observations on Stretchers.—The basis of all stretchers used in carrying conscious or unconscious patients indoors is, first, a canvas sheet, six feet long and from three to three and a half feet broad, and, secondly, two stout poles, seven or eight feet in length, which are run through canvas tubes made in the carrying sheet and extending the whole length of it. At either end, therefore, the poles protrude a foot

or less, sufficient to allow the bearers to secure a firm hand-hold.

In hospitals the patient is nearly always lifted from the stretcher on to the operating table, but in nursing homes and private houses it is quite common to place the sheet itself beneath the patient on the table, so that direct removal is effected at the end by simply adjusting the poles. In the former case, the patient is lifted from the table on to a wheeled stretcher, which is obviously easier to handle. Whenever manual removal is resorted to, it must be remembered that the dead weight of most adults will prove too much for women. The weight, too, is not evenly borne in climbing. Here the bearer stationed at the patient's head will have a very heavy load to support. The stronger bearer should, therefore, take this position.

Ringed iron bars, the width of the stretcher, are used to steady it at either end; the wooden carrying poles are run through the rings. This arrangement helps to make a steady, even "platform" for the patient. Without some device of this kind, the limp, unconscious body would sag down, and the sides of the canvas stretcher, closing in everywhere, might very easily impede respiration. Moreover, with fixed ends the bearers have a space free from undue pressure while in motion.

Some throat hospitals make use of a short canvas sheet, just sufficient to take the head and

trunk, while the legs are allowed to hang down over the front bar. It is very handy for transport from a lower to a higher floor.

There are very many variants in stretcher designs, some of them having for their object the minimising of labour, others the more equal distribution of dead weight, while some provide not only for the carriage of the patient, but, further, for his protection *en route*. A stretcher with this latter aim has been designed and is in constant use. The sheet for bearing the body weight is made in the usual length, and the carrying poles are fitted in the manner already described. Over the outer coverings (blankets, etc.) another canvas sheet is spread, wide enough to cover the body, and extending from the top of the chest to the feet. Three buckles, one top and bottom, and another in the middle, are sewn on to the right margin of the sheet in its long diameter, while on the opposite side corresponding short leather straps are fixed. Just before the removal, this upper sheet is carefully adjusted and secured. By this means all coverings are kept closely in place. Naturally, the upper sheet must not be unduly tight, so that the lungs and diaphragm may have full play.

A very effective procedure is arranged as follows: Take the ordinary canvas sheet and cut large grip-holds at each end and on either side. Then have a somewhat wide and strong leather strap secured to the right lateral eyelet,

and sufficiently long to pass over the shoulders of a bearer to the left lateral eyelet, where it is finally buckled. That portion of the carrying strap which passes behind the neck is well padded and covered with wash-leather. When the patient is placed in position, the bearer yokes himself to the stretcher, standing on the left midway between the head and feet, assuming naturally a slightly bent attitude, and grips the sides of the stretcher at the points where the strap is fixed. Two nurses, if men are not available, secure the stretcher at either end by inserting their hands into the grip-holds provided. The dead weight in lifting falls to the yoked bearer, while the two assistants at head and foot of the patient have a comparatively light task. This method is very useful in negotiating narrow, precipitous stairs.

For rapid and effectual removal of children from the table to the recovery room, after operations for tonsils and adenoids, the following plan is in use at Charing Cross Hospital, and may be commended. When the adenoids have been removed, the patient is placed in the right lateral position, and enucleation of the tonsils is rapidly effected. The little patient is then carried out by the nurse with head dependent and body resting against her right hip. In this way no change of posture takes place, and any blood collecting drains out of the mouth and away from the throat.

For adults, a good lifting plan is carried out in this way. Assuming that the operating table and the patient's bed are in the same room, two bearers, very often the surgeon and the anæsthetist, standing opposite the patient's chest and legs, place their arms well beneath the trunk and thighs, and lift the patient up to and against their own chests; at the same time an assistant draws aside the table so that the bearers have a clear space in which to move forward. This may be called the chest to chest or lateral lift. The body does not sag down, and carriage is effected with considerable economy of strength.

Ethical Conduct.—Nurses should have little additional to learn in regard to deportment or manner of acting where anæsthetics are concerned, little that they have not already been well grounded in by their general teaching. Perhaps a word or two may be allowed on the subject of theatre discipline. This may be briefly grouped under three headings: Discipline of the eyes, of the tongue, and of the hands. To take the last first, awkward and clumsy handling of instruments, dropping bowls and other impedimenta, noisy moving about of chairs and pots and pans generally, as well as the noisy rattling down of sterilised instruments on to glass or metal tables—these are all undesirable in an atmosphere of serious and strained attention. Some noise is inevitable where events move rapidly; nurses must always strive to reduce it to a minimum.

Nothing is more disturbing than violent clattering of metal on marble or even on wooden floors, or the loud slamming of covers in the sterilising room.

The rule as to *silence* is imperative in a surgical theatre. The nurse should be seen but not heard. Conversation, if necessary, must be carried on in low tones, and, as often as not, in whispers. The sister alone speaks aloud, but only to answer questions asked by the principals. or to give orders. Messages for anyone in the theatre are to be given in whispers. Written communications, if urgent and directed to anyone immediately engaged in the operation in progress, are usually ordered to be opened and held up for inspection by the person to whom they are addressed.

Of the discipline of the eyes, little need be said, It is obvious that a well-trained nurse will have her whole attention devoted to the work in hand, and so she is expected to watch everything and see for herself what is wanted or likely to be called for at any moment. She may feel surprise or anxiety, or even terror, in the presence of some tragic crisis, but she must not show it—at least in her eyes. Luckily, in most cases all assistants nowadays are heavily masked, so that all emotion, pleasurable or otherwise, is seen, if seen at all, through a veil, dimly.

Theories concerning the Cause of Shock.—In a former section the signs and symptoms of surgical

and anæsthetic shock have been referred to and explained. It will be of interest to nurses to have some knowledge of the physiology of the conditions.

Briefly epitomised, there are two main theories :—

1. Crile's theory of deoxygenation or paralysis of the vaso-motor centres, with a manifest transference of the blood from the arteries into the veins.
2. Henderson's acapnia theory, or the hyperactivity of the vaso-motor centres through loss of carbon-dioxide from the tissues and the circulating blood.

Crile's Theory (1).—The phenomena of shock, according to this theory, are due to the exhaustion of the vaso-motor centres in the medulla and spinal cord, with the resultant loss of control of the pressure of the blood in the arterial system, and the consequent collection of the blood in the great splanchnic reservoir in the abdomen. The fall in blood pressure which follows this loss of control is accompanied by a fall in the general body temperature ; the respirations become weak from secondary exhaustion of the respiratory centres, the blood and tissues are not properly oxygenated, and the oxygenation starvation, if not checked, leads to loss of consciousness and eventual paralysis of all vital functions and death.

Prevention of Shock (*Crile*).—Prevent, as far as possible, the loss of blood. Atropine, hypoder-

mically administered, was an efficient protection against cardiac inhibition in operations in the "inhibition area" in the larynx, and in such operations as might cause mechanical stimulation of the vagi. Cocaine, hypodermically injected, guards the heart against cardiac inhibition almost as efficiently as does atropine. . . . Tearing, manipulating, stretching, forced dissection, all tend to produce shock, more than the use of sharp instruments and gentle manipulation.

Henderson's Theory (2).—Numerous experiments led this observer to the following conclusions. The condition of low arterial pressure noted in shock is not due to fatigue or inhibition, or failure of any sort in the vaso-motor centre. The failure of circulation appears to be due to diminution in the volume of the blood by transudation of its fluids out of the vessels into the tissues. It is a complex peripheral process, induced initially by the influence of acapnia upon the veins and capillaries, and upon the tissues.

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